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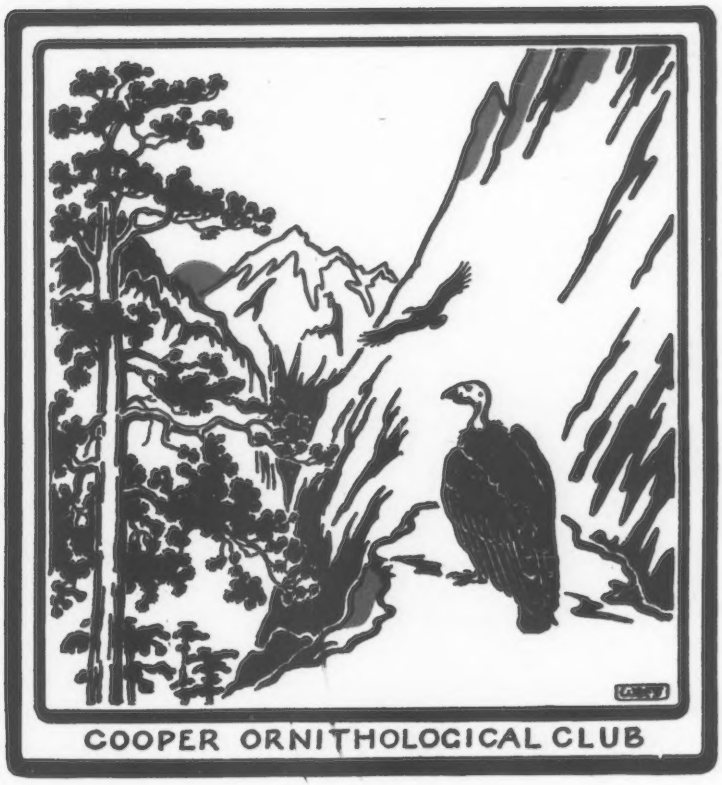
# THE CONDOR

## A Magazine of Western Ornithology

Volume 48 January-February, 1946 Number 1



COOPER ORNITHOLOGICAL CLUB

# THE CONDOR

## A Magazine of Western Ornithology

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*Published by the*
COOPER ORNITHOLOGICAL CLUB

VOLUME 48

*Edited by*
ALDEN H. MILLER

JEAN M. LINSDALE
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*Associate Editors*

W. LEE CHAMBERS
JOHN McB. ROBERTSON
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BERKELEY, CALIFORNIA
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Museum
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Wilson Ornithological Club

THE CONDOR

VOLUME 48 JANUARY-FEBRUARY, 1946 NUMBER 1

# WAR AND THE BIRDS OF MIDWAY ATOLL

By HARVEY I. FISHER and PAUL H. BALDWIN

Concern about the fate of the Laysan Rail and the Laysan Finch and about the possible effect of war activities on insular populations of birds in the Hawaiian Archipelago led the National Park Service, the Fish and Wildlife Service, and the Board of Agriculture and Forestry of the Territory of Hawaii to make a survey of the bird life of Midway Atoll. The United States Navy cooperated in furnishing air transportation to and from Midway. This report combines the observations of Baldwin who represented the federal bureaus, and of Fisher who represented the territorial board. The original plan was to capture, if possible, rails and finches for transplanting back to their original home, Laysan Island, and to observe the effects of the war on populations of birds at any islands visited.

A careful search from May 7 to 18, 1945, convinced us that no rails or finches remained on either Eastern or Sand islands, the two islands constituting Midway; consequently, we did not go to Laysan but spent the entire time observing the birds on Midway. We attempted to obtain accurate estimates of the number of colonies and of the sizes of the populations of the various species. This information was to provide the basis for comparing present bird life with pre-war bird life to determine the trend of the populations. Subsequent perusal of published notes and articles, however, indicated that few observers had estimated the numbers of birds present, and those doing so did not distinguish between breeding and migrating individuals and did not record the means by which they arrived at their estimates.

## ESTIMATES OF POPULATIONS

Our methods of estimating populations involved (1) counts on sample areas yielding a density figure for the number of birds per acre, (2) an estimate of the size of the bird habitat in acres, and (3) adjustments to arrive at a final figure representing the adult or in some cases the adult breeding population. The methods necessarily varied in application to each species, as some could be counted more satisfactorily than others. We tried to use methods which could be duplicated in the future and thus to provide a basis for comparable estimates which would reveal changes in the populations.

Although we believe the general order of magnitude expressed by the figures in table 1 is valid, a high percentage of error is possible in several instances. When the habits and daily movements of the various species are well known, more accurate counts should be obtainable. For certain species we found it necessary to make counts in mid-morning and mid-afternoon and by flashlight at night to obtain an average estimate. Because of these and other sources of variation in our method of estimating, it seems desirable to state briefly the method employed for each species.

Laysan and Black-footed Albatrosses.—Nestlings were counted and the total number estimated by the density-times-area method. Two adults were allowed for each chick. A slight additional allowance was made for non-breeding adults, but this adjustment probably falls within the limits of error. Night counts were made on resting adults.

Wedge-tailed Shearwater.—Adults above ground were counted on Eastern Island, where there were few burrows, and the density-times-area method was used. Since most of the birds were paired and on the ground, only 10 per cent was allowed to represent single adults in burrows and in flight during the day. A similar method was used on Sand Island, but the figures are less reliable due to the great numbers of burrows present.

Christmas Island Shearwater.—The adults were counted and the density-area method was used. Because none was found in burrows and because more than 75 per cent of the birds were incubating individuals, each representing a pair, 75 per cent of the computed total was added to correct for absent members of the pairs.

Bonin Island Petrel.—Density-area figures were used, but the figures are difficult to interpret because of the irregular distribution of this species over the island, the great number of occupied burrows, and the separation of members of most of the pairs.

Bulwer Petrel—Simple density-area figures were used since there were no burrows, and the birds were almost invariably found in two's. The estimate probably is low because it is thought that the birds were just coming in to the island.

Red-tailed Tropic Bird.—Adults on the ground were counted. A density-area figure was computed and 94 per cent was added because 94 per cent of the adults on the ground were alone and incubating. Although one half-grown chick was found, it is likely that the breeding season was just getting well under way. The figures may be low because it was impossible to consider the many birds wheeling overhead.

Blue-faced Booby.—Only three adults were observed and they were in a single group at a nest containing one young and one infertile egg.

Red-footed Booby.—Nests in the only colony were counted and the number doubled to yield the number of breeding adults. Few immatures were noted, and most of the nests contained young or a well incubated egg. The estimates may therefore be considered reliable.

Frigate Bird.—This species was counted as a flock in the air and on the *Scaevola* bushes on several occasions.

Pacific Golden Plover, Bristle-thighed Curlew, and Ruddy Turnstone.—Estimates were based on numbers observed.

Gray-backed Tern.—Estimated number is that in the colony on Eastern Island. No individuals were observed away from this colony.

Sooty Tern.—We made density-area computations during the day and at night in the colonies. These figures were checked against numbers in flight when the colonies were disturbed. Because egg-

Table 1

Estimated Numbers of Individual Birds on Midway Atoll

| | Sand Island | Eastern Island |
|---|---|---|
| Black-footed Albatross | 35,000 | 18,000 |
| Laysan Albatross | 75,000 | 35,000 |
| Wedge-tailed Shearwater | 40,000 | 22,000 |
| Christmas Island Shearwater | 0 | 400 |
| Bonin Island Petrel | 25,000 | 0 |
| Bulwer Petrel | 0 | 600 |
| Red-tailed Tropic Bird | 10,000 | 9,000 |
| Blue-faced Booby | 3 | 0 |
| Red-footed Booby | 0 | 450 |
| Frigate Bird | 60* | 60* |
| Chinese Pheasant | 2 or 3 | 0 |
| Pacific Golden Plover | 150 | 100 |
| Bristle-thighed Curlew | 12 | 8 |
| Ruddy Turnstone | 250 | 100 |
| Gray-backed Tern | 0 | 750 |
| Sooty Tern | 170,000 | 4,000 |
| Noddy | 0? | 10 |
| Hawaiian Black Noddy | 1,350 | 750 |
| Fairy Tern | 15,000 | 5,000 |
| Domestic Pigeon | 50 | 0 |
| Domestic Canary | 30 | 0 |

*Same birds on both islands.

laying was just beginning at the time of our visit, it is possible that other colonies formed after we left.

Noddy.—Estimate was based on number observed.

Hawaiian Black Noddy.—For Eastern Island density-area computations were made to arrive at the number of birds present in individual colonies and in all the colonies together. This figure was arbitrarily doubled to include birds in the air and birds away fishing. Counts for Sand Island were made similarly but were complicated by the necessity of estimating numbers in the tall ironwoods (*Casuarina*).

Fairy Tern.—This was the most difficult of all the species to estimate because of its wide and variable distribution in many different situations on both islands and because all stages of the breeding cycle were represented. The final estimate was based on density counts in various habitats and was augmented by adding 75 per cent to include absent mates of nesting adults.

The methods described above were used independently by the two of us, and the numbers presented in table 1 represent a compromise of the two estimates. It should be pointed out, however, that the independent estimates varied less than 15 per cent.

## ACCOUNTS OF SPECIES

*Diomedea nigripes*. Black-footed Albatross. This species has apparently not been disturbed as much by war activities as the Laysan Albatross, the principal reason being that in general it confines its activities to the outer fringes of the beach where there has been less disturbance of its physical surroundings and where it is less subject to the activities of man.

Aside from usurpation of some of its nesting areas, the greatest harm from war has come to this species through the use of barbed wire and the occasional use of it as a target. Its numbers have not decreased as much as those of the Laysan Albatross, and its decrease is not such a serious matter for it is known to be more widely distributed. Birds banded on Midway in December, 1940, have been retaken at such widely separated places as Tokyo, Japan, Oregon, and Cape Omeny, Alaska. Its breeding, however, is confined to islands of the North Pacific (Bryan and Greenway, 1944:92).

Judging from size, molt, and behavior at the time of our visit, the young appeared to be about of the same age or slightly older than those of the Laysan Albatross.

*Diomedea immutabilis*. Laysan Albatross. The numbers of this species are definitely much lower now than before the war. A number of factors mentioned elsewhere in the text are responsible. In 1941, Hadden estimated the number at 20,000, probably based on the figure of 2,000 in the Pan American Compound. This compound is very small compared to the remaining area of Sand Island which is also used by this species. Consequently, we feel his estimate was unduly low. Further, there is no mention of the month in which the estimate was made. Certainly there are no factors which would have increased the numbers of Laysan Albatrosses on either Sand or Eastern island. Mr. Pitko of the cable company thinks there are only half as many goonies now as before the war.

We would estimate that less than one-half of the total area formerly occupied by this species is now used. Some of this decrease is due to disturbance by war activities, but there are other sites that seem suitable which are not used for some unknown reason. A large, recently filled area on the southeast corner of Sand Island is not used at all although it apparently is just as suitable as other parts. The most concentrated nesting, as indicated by the young now present, is that in the middle of the barracks area and alongside the most used road on the island. It may be that the birds tend to go back to the same spot for nesting each year and that the young also go back to the same area for their nesting. This might explain the failure of the birds to use the newly added land as a nesting site and might also account for the concentration on a site where it is thought disturbance would now be most severe.

*Puffinus pacificus cuneatus*. Wedge-tailed Shearwater. This species is especially vulnerable to disturbance by man. In spite of this, employees of the cable company think it has increased in numbers during the last twenty years—a notion we are inclined to doubt. The population might have been increasing up to the beginning of the war, but since that time it must have declined. One factor that may affect our census is the tendency of individuals of this species to leave the nesting grounds in late May and early June for a period of two to four weeks. This is known to occur on some islands and it may take place on Midway.

Individuals of this species were almost always observed in pairs on the ground under *Scaevola* bushes. On Sand Island night observations revealed them in pairs and digging burrows. Only infrequently were they observed on the surface of this island by day. On Eastern Island no burrows were found, and here pairs might be observed at any time of the day. For the most part they were resting quietly under *Scaevola* bushes, but some were flying overhead at all times.

Egg-laying had not yet begun. The eggs of this species are frequently laid on the sand at the entrance to a burrow. This peculiar habit gives rise to another form of depredation by man. We were told that on this and other islands the eggs were picked up carefully from certain areas each morning. By continuing this practice the eggs were always fresh and edible. On certain islands during the war this probably was a necessary procedure, but no longer is there any need for such exploitation. With a large company of men carrying on such hunts, it would be entirely too easy to wipe out the annual

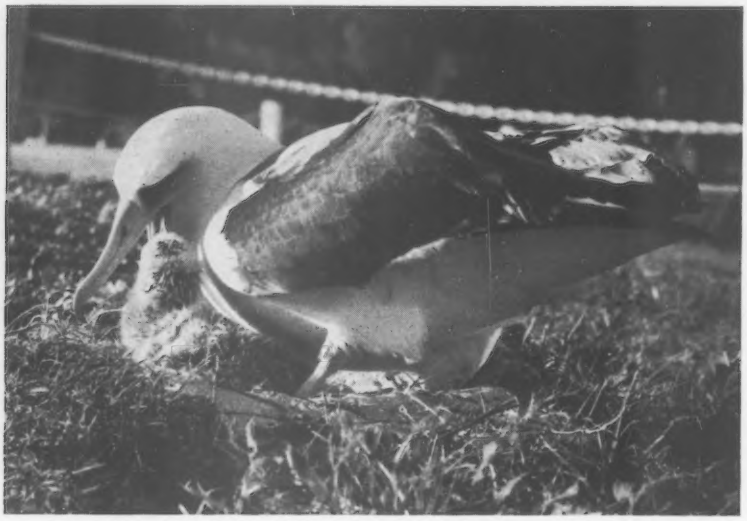

Fig. 1. Laysan Albatross feeding young. Note the nest "bowl" on the lawn. Photo by courtesy of United States Navy.

increment for a few years and thus to destroy all of a population using any one island for nesting. This possibility is increased because all the birds in an area tend to lay their eggs within a period of three to eight days.

Bryan (1906:39-40) stated that in 1902 most of the surface of Eastern Island was honey-combed with the burrows of the Wedge-tailed Shearwater and that the central portion of the island had vegetable mold and guano mixed with the coral sand. In 1945, we found neither mold nor guano on this island; for the most part there were only piles of sand and coral rock, evidently dug up by bulldozers during the period of construction work. Bryan also found this species only occasionally on Sand Island.

*Puffinus nativitatis*. Christmas Island Shearwater. This species occurs only on Eastern Island and at the time we were there was relatively scarce. It does not dig burrows. The birds were found under the *Scaevola* brush, usually as single individuals sitting on a single white egg placed in a slight depression. Sometimes the depression contained leaves of *Scaevola* which probably had fallen or been blown into it. Often the egg was merely placed among rocks as big as a man's fist. Eggs were present when this species was first seen on May 9.

Disturbance of the brush and of the rocky parts of the island have probably adversely affected this species, but no information is available. If the numbers we saw represent the entire breeding population, the species must be watched closely in the future.

Bryan in August, 1902, did not find this species on either island. Munro (1941*b*: 16-18) found a few individuals on Eastern Island in 1891 but many on Laysan and other leeward islands; Donaghho (1941:33) found it on both Eastern and Sand islands in May, 1941.

*Pterodroma leucoptera hypoleuca*. Bonin Island Petrel. This petrel was found only on Sand Island. A possible reason for this may be the fact that it uses burrows, and most of the surface of Eastern Island is now too rocky for burrowing. Another reason may be the fact that a major part of the

interior of Eastern Island is covered with paved runways. This pavement may cover its former nesting area which very likely was localized in the central part of the island.

At the time of our visit, the nesting season of this species was over. A few young with partial development of flight feathers were observed in the entrances to burrows and in depressions in the sand during daylight hours. Either a great percentage of the young was already flying or the season's nesting was particularly unsuccessful, for we saw few young and could find none in most of the burrows examined.

The species is affected by the same factors as those affecting the Wedge-tailed Shearwater, but the decimation in numbers is more important because the Bonin Island Petrel is not so widely distributed. Atsatt (1945:51) states that rats live in the burrows of this species and consequently exert a greater pressure on it.

In 1941, Hadden made what he called a conservative estimate of 500,000 "on the island." Even thought he may have included both islands in this estimate, comparison of this figure with our estimate in May, 1945, of 25,000 shows a decided and alarming decrease in numbers.

*Bulweria bulwerii.* Bulwer Petrel. This species was found almost exclusively in pairs, crouched among rocks under dense *Scaevola,* but not in burrows. It was confined to Eastern Island. Its absence on Sand Island is unexplained unless extermination has occurred. Men from the cable company said the bird used to nest on Sand Island several years ago. Donaghho banded three on Sand Island in September, 1940; and Munro (1941*a*:2) states that the species was abundant and nesting on Eastern Island in July, 1891. It is probable that these birds were just coming in to the islands for nesting; consequently, the estimates given in table 1 may be too low. On Popoia Islet off Kailua, Oahu, this petrel has been practically wiped out by rats in the last few years. Hence, the birds on Midway must be watched carefully.

*Phaëthon rubricauda rothschildi.* Red-tailed Tropic Bird. Ninety-four per cent of the birds observed on the ground were incubating single eggs. One half-grown bird was found. For the most part individuals were nesting in clumps of *Scaevola,* but some were nesting in relatively open sand, under lumber piles, and in the grass around the buildings.

Both islands have fairly large breeding populations, and at present there seems to be little cause for alarm about their numbers. Unquestionably the species has been affected by the surface changes, but seemingly it is adjusting itself. Nesting concentrations were evident in certain areas of shrub growth, although nests were distributed generally over the islands, even in recently disturbed and highly artificial surroundings. We doubt that rats would have opportunity to destroy eggs or young when an adult is present at a nest; the adults are reluctant to leave and they use their sharp bills most effectively.

*Sula dactylatra personata.* Blue-faced Booby. Only three adults were found, and these were around a single nest on the open sand of Sand Island. One newly hatched young and an infertile egg were in the nest. It is highly unlikely that this colony will survive. The one nest was found at the edge of a colony of Sooty Terns alongside a road and a runway. Jeeps and trucks pass within a few feet, and if one takes to the sand, as the tracks indicate they often do, the young will be destroyed.

*Sula sula rubripes.* Red-footed Booby. One colony located on Eastern Island now contains all the individuals of this species on Midway Atoll. In May the colony was well into the nesting season. Some nests contained a single egg, others had newly hatched chicks, and still others had half-grown chicks. Only one of the 194 nests was in process of construction.

Disturbance of the *Scaevola,* which is used as a nesting site, and the presence of man and his impedimenta are the factors tending to decrease the numbers of this booby. Another factor may be operating now and certainly will harm this species in the future; we refer to increased parasitization by the Frigate Bird as a consequence of the virtual elimination of the other two species of boobies on Midway Atoll. Since the Frigate steals fish from the adult and is not averse to eating a young booby, this added pressure may cause a serious drop in the size of the colony. At present there are about eight adult boobies to one Frigate. If the Frigates survive at the expense of the young boobies, the colony will be eliminated within the next few years.

*Sula leucogaster plotus.* Brown Booby. No individuals were seen on either island. In 1941, Hadden reported that this was the most common of the three species of boobies at Midway. Donaghho (1941:33) also reports three species in August of 1941. Utilization of its colonial nesting areas for military purposes and perhaps rat infestation are the factors involved in its extermination. The second factor probably is unimportant, for it would seem almost impossible for a rat to enter with impunity a colony of these strong, sharp-billed birds.

*Fregata minor palmerstoni.* Frigate Bird. The numbers of this species seem destined to decrease at Midway in the near future. Since the population now consists of only 60 individuals, the colony is in a vulnerable state. Several unfavorable factors resulting from the war have brought this

about. The decrease of boobies, which the Frigates parasitize, removes a source of food. The wide disturbance of the shrub vegetation appears to have upset nesting, since no nesting has as yet been observed this year. Destruction of the *Scaevola* brush also affects the birds by elimination of perching sites. The Frigates' feet and legs are so constructed that take-off from the ground is difficult if not impossible. Regrettably this conspicuous bird is a tempting target for sport shooting and it is subject to popular anathema because it is known as a "hawk." Frigate birds perching on trees at Sand Island rose into the air each time an airplane passed overhead.

We were told that the Frigates used to nest on Sand Island, and one point of this island is named Frigate Point. No nests were found on either island, but men stationed there stated that in 1944 this species nested near the one remaining colony of Red-footed Boobies on Eastern Island. In August, 1902, Bryan found Frigates nesting only on Eastern Island. The one group of birds we saw moves back and forth between the two islands almost daily, but it is not a regular movement. Sometimes the Frigates are on Sand Island in mid-morning and sometimes they perch in the ironwood trees there in the dusk. In December, 1938, Hadden (1941) observed more than 500 Frigates in the air.

*Phasianus colchicus*. Chinese Pheasant. A single cock was heard on several occasions about the farm on Sand Island, and a hen was seen. In 1944 some young were raised but did not survive many weeks. There is little chance of this species surviving in the wild state on Midway; there is too little native food. However, to prevent increase in numbers, if necessary, the birds should be collected. In a small spot of land as saturated with entertaining bird life as is Midway, it appears undesirable to establish foreign species.

*Porzanula palmeri*. Laysan Rail. Eastern Island of Midway Atoll was probably the last home of this rail, as E. L. Caum and Sergeant Lewis W. Walker, U.S.M.C., saw two there in July, 1944. On Eastern Island there is now no bunch-grass habitat, and there are only about 75 acres of *Scaevola frutescens*. *Scaevola* is found in patches ranging in extent from a few square yards to several hundred square yards. Much of it is or has been disturbed. We examined most of this shrub growth by crawling through it on hands and knees, waiting quietly and observing. On about 6,500 square yards in 27 representative samples of vegetation thus searched, counts of all other species seen were made. Had the rail been present it is likely that at least one individual would have been seen during these careful observations. Likely feeding places, such as the carcasses of dead birds where the flies were swarming, were also watched.

We were unable to find this species on Sand Island using similar methods of search. Messrs. Smith and Pitko, of the commercial cable station, have each served several tours of duty on Midway in the last 20 years; both are well acquainted with the rail and its habits because of its abundance during past years. The last rail observed by either was in November, 1943, when Smith saw a young rail and heard another on Sand Island. We could learn of no naval personnel who had actually seen rails within the past year; one or two reports which we investigated turned out to have been based on observations of the Ruddy Turnstone. Since our visit to Midway, Munro (1945:14) reports that Captain John Jayne, U.S.N., was certain he saw a rail in the first week of June, 1945, presumably on Midway and only three weeks after our visit.

The main factor in the extermination of the rail was the overrunning of both islets with rats, which escaped to Midway from ships in 1943. Had the birds survived the extreme rat infestation of 1943 and 1944, they might still find cover and continue reproducing now that the numbers of rats are reduced. Much suitable rail habitat has been destroyed or modified by "clean-ups" of rank grass and brushy undergrowth in certain areas and cutting of *Scaevola* brush into small and isolated blocks. This may have been a secondary cause of their extermination. A surviving clump of especially tall grass in the cable station area was pointed out as having harbored a number of rails in the past.

There may be rails on Pearl and Hermes Reef, but we think it unlikely. In 1929, Captain Anderson moved seven pairs of Laysan Rails to Pearl and Hermes Reef from Midway (letter from G. C. Munro); however, Mr. George O. Kaufmann, who lived at Midway from 1929 to 1931, visited the reef in 1930 and found no rails, no living vegetation and very few birds of any kind. Galtsoff (1933:1-49) does not list the rail. Since the rail depended upon insects, birds' eggs, and meat scraps for food, it seems impossible that the colony could have survived.

*Pluvialis dominica fulva*. Pacific Golden Plover. Individuals and flocks of as many as 40 were observed on all areas of both islands. The population figures for this species mean relatively little since Midway is but a resting place for them on their long migratory route. Most of the birds were in breeding plumage. We were told that individuals in winter plumage remain there throughout the year. Summering individuals which we have seen on the main Hawaiian Islands were invariably in winter plumage or in only partial breeding plumage.

*Numenius tahitiensis*. Bristle-thighed Curlew. Only a few individuals were observed. Since the birds only stop here in the course of migration, war activity on Midway probably has had little effect

on them. Usurpation of the surface for other purposes has of course decreased the area available to them, but if they can always feed on the leavings around the nests of albatrosses as was observed, their food supply is plentiful. The birds were not limited to any one part of the island or to any certain habitat.

*Arenaria interpres*. Ruddy Turntone. As is the case of the plover and curlew, the turnstone is widely distributed over the Pacific. Some apparently winter on Midway. This species was not found on the sandy or rocky beaches as is usually true on continental shores; they were inland, foraging on lawns, in the brush and under ironwood trees.

*Sterna lunata*. Gray-backed Tern. Within a single colony of this species on Eastern Island, egg-laying was just beginning at the time of our visit. Formerly, we were told, this species nested on Sand Island. The present colony was located under a clump of *Scaevola*. The birds were not nesting in open sandy areas as the Sooty Terns were, but they perched in the *Scaevola*, over the colony or on the sand in the colony. Mixed with the colony were Sooty Terns which had not yet laid their eggs. At the time we left, the Sooties were still in the colony, but it is not possible to say whether they actually nested with the Gray-backed Terns.

Destruction of the *Scaevola* has probably had a more deleterious effect on this species than have other factors. The population has been reduced since the war started and must be watched with care since it contained only about 750 birds.

Rothschild (1900:38) states that, "The Gray-backed Tern was met with on all islands, *except Midway Island* [italics ours], and was breeding in great numbers on Laysan Island." It is not likely that Palmer, Rothschild's collector, would have missed this bird had it been present. Nor can we find any mention of it in the running account of the Rothschild Expedition on Midway, as given by G. C. Munro in volume 3 of *The Elepaio*. Bryan (1906) reported that in 1902 he also could not find it on Midway. Consequently it appears that the present colony has been established since 1900. Hadden in 1941 reported 500 Gray-backed Terns on Sand Island, where we found none in 1945.

*Sterna fuscata oahuensis*. Sooty Tern. The Sooty Tern is now the most numerous species found on the islands of Midway. At the time of our visit, individuals were just arriving on their nesting grounds and new colonies were forming almost daily. At the time of our departure there were at least ten colonies on Sand Island and only one on Eastern Island. The colonies on Sand Island are larger than the one on Eastern Island, varying in size from 4,000 to 100,000 individuals. In 1902, Bryan (1906) found more Sooties on Eastern Island. On both islands colonies were found in open sandy areas and under clumps of *Scaevola*. When the colonies were visited on May 7, no eggs were found; the first eggs were seen on May 10. Defense of territory, copulation, and egg-laying were going on simultaneously in all colonies within a day after the birds had settled down.

Great numbers of these birds are killed by ground vehicles and planes. Because of their wide distribution and the great numbers now present, the species is in no danger of extinction on Midway. However, there has been a significant drop in numbers since 1941 which, if occurring on other islands of the chain, might threaten the subspecies *oahuensis* in this archipelago. Hadden (1941:19) reported nearly 600,000 Sooty Terns on Sand Island in 1941.

*Anoüs stolidus pileatus*. Noddy. It is questionable whether the Noddy was ever abundant at Midway. The extremely small number seen by us indicates either that this species is nearing elimination from this atoll or that the main numbers of this species were not present on the breeding grounds when we visited them. The former is more likely, as W. K. Fisher (1903:15) found the noddies just beginning to lay eggs on Laysan between May 16 and 23. W. A. Bryan (1906) in August, 1902, found but few examples of this species on either island at Midway. In 1941, however, Hadden reported about 2,000 on Sand Island. If the population has indeed dropped, rats and destruction of nesting grounds are most likely the decimating factors.

The Noddy was found breeding on all the leeward islands of the archipelago by the Rothschild collectors in 1891, but nowhere in large numbers. It breeds today on certain islets offshore from islands of the main Hawaiian group. Munro (Elepaio, 1(12):2-3) reported that on Swain's Island near Samoa this species was nesting in the tops of tall cocoanut trees, evidently to escape from pigs that ranged the island. We did not see Noddies in the ironwood trees at Midway but found them perching on the ground, on bushes, and on rocks at the lagoon shore.

*Anoüs minutus melanogenys*. Hawaiian Black Noddy. Nests of this species were characteristically found rather high in the *Scaevola* scrub and in groups of 5 to 20. Some nests were unoccupied, some had fresh eggs, and others had young of varying ages up to those which were completely feathered. This indicates that the species has a long breeding season; it may even nest throughout the year. If the latter is true, it may aid in maintaining the species by decreasing the depressing effect of certain seasonal factors.

This species has begun to nest in the high ironwoods, where they are relatively safe from man

and rats. It is in no apparent danger on Midway, and it also breeds on other islands of the archipelago. Men of the cable company believe the birds are more numerous on Sand Island now than they were 15 years ago. This is corroborated by the finding in 1902 by Bryan (1906) of only 12 to 20 individuals on Sand Island. It may well be that the growth of the ironwood trees, of *Scaevola*, and lately of other shrubs has encouraged them during the past 40 years. Sand Island was practically barren of vegetation in 1902.

*Gygis alba rothschildi*. Fairy Tern. Except for possible damage to eggs and young by rats (Atsatt, 1945:49-51) this species is probably the least adversely affected by war activities of all kinds of birds now on Midway; it may have actually increased in the last 20 years. Bryan in 1902 found only a few on Sand Island. Hadden estimated 3,000 to be present on Sand Island in 1941, whereas our estimate for Sand Island is 15,000. It nests throughout the year apparently, and it is numerous in all areas of both islands. Nests may be found in *Scaevola*, on ridgepoles of buildings, on signposts and in ironwood trees. There is no built nest; the egg is laid in a slight depression or crack atop a post, pole or building or in the forks of trees and shrubs.

W. K. Fisher (1903:9, 17) found *Gygis alba* nesting on Necker Island in bowl-like hollows in the rock and thought it was more abundant on Necker than on Laysan because the rocks on Necker provided better nesting sites.

*Columba livia*. Domestic Pigeon. About 50 individuals are to be found on Sand Island; none is present on Eastern Island. They have started nesting in the ironwood trees and are gradually expanding the area they use. Although they are now limited to the region of the compound of the cable company, it is likely they may spread. In the past the men of the company have prevented spreading by shooting birds found nesting away from the farm area. This practice should be continued if pigeons are to be kept on the island, and all nests in trees should be destroyed. The effect of competition between pigeons and terns is unknown, but a definite competitive struggle for nesting sites could develop.

*Telespiza cantans*. Laysan Finch. The absence of the Laysan Finches on Midway was attested by the presence of a hibiscus hedge in full bloom. We were told that when the finches were present, they snipped off the buds so rapidly that seldom was a red blossom found. Records concerning the present status of the finch are incomplete. It is gone from Midway. The only other known colony was on Laysan. According to E. H. Bryan, Jr. (letter dated April 3, 1937, to G. C. Munro), W. F. Coultas saw "at least 1000" finches on Laysan in 1936. Bryan (personal communication) desires to retract his statement (Bryan and Greenway, 1944:136) that the finch is extinct, because his writing on the statement published in 1944 antedated the findings of Coultas in 1936.

Hadden (1941:194) condemns the finch and states that it should be outlawed and destroyed at every opportunity. It is unfortunate that such an attitude ever existed on Midway. In all probability, rats and man are the factors responsible for its extermination on Midway. Atsatt (1945:49-51) states that the disappearance of the finch was as abrupt as that of the rail, but the rail was exterminated first.

*Serinus canarius*. Domestic Canary. There are perhaps 30 individuals about the lawns and ironwood trees of the cable compound; we never saw more than 17 at any one time. No evidence of nesting was observed, but we were told that in late years the canaries have nested high in the ironwoods, probably to escape the rats.

From the high population of about 500 several years ago this species was reduced to negligible numbers; at one time it was thought to be extinct, and the rats were blamed. Apparently canaries are breeding with at least some success now, possibly as a result of their having moved into the higher trees to nest.

### WAR-TIME FACTORS DECREASING POPULATIONS OF INSULAR BIRDS

*Physical disturbance*.—1. The removal of and injury to nesting and roosting sites by bulldozing for construction projects of many sorts, trampling everywhere by men, driving across open and semi-open areas in vehicles of many types, landscaping of grounds for ornamental purposes, clearing of vegetation around utility areas, erection of barbed wire barriers and similar contrivances exerted major influences upon the birds. The *modus operandi* of these is obvious: usurpation of nesting area by permanently constructed physical developments, churning and removal of top soil or sand, breaking of vegetation, grading of surfaces, and establishment and maintenance of many artificial cover conditions. These changes have affected all ground- and bush-nesting species, indeed the entire bird life at Midway.

2. Death of individual birds was caused by airplanes, ground vehicles, traps and

pits (foxholes, gun emplacements), attacks upon disliked species, target shooting, and construction work. Almost all species present were seen to be affected. The clearing of carcasses was a regular, daily operation to keep down the flies and to reduce the food supply of the rats. Carcasses were evident daily on airfields and roads, in gooney colonies, and in pits. As an example, planes, during normal approaches to a landing strip where a small colony of 5,000 was situated, were seen to cut up about a dozen Sooty

Fig. 2. Adult Laysan Albatrosses resting on lawn at Midway Post Office. Many young were present here in May, 1945. Photo by courtesy of United States Navy.

Terns. Dead albatrosses and tropic birds could always be seen near the mats. Night flying was especially destructive to birds and resulted in greater slaughter of the Sooty Terns than did daytime flying. Petrels and shearwaters were vulnerable at night, also. Ground vehicles accounted for large numbers of dead, noticeably along roads, from which unwitting, young albatrosses had to be removed each morning by the first driver, and near airfield mats where vehicles occasionally ran through the edges of bird colonies. One such colony of Sooty Terns lost 83 birds to ground vehicles in one night and 68 in the following night. The death toll would have been greater had young been present. Foxholes and other types of steep-sided pits caught albatrosses, shearwaters, petrels and tropic birds. The birds were found starved to death. Many holes had already been filled in at the time of our visit to reduce bird destruction but many still remained open. Black-footed Albatrosses, and other species to a lesser extent, became entangled in barbed wire along the beaches. The "moaning birds," of which the Wedge-tailed Shearwater was the most dismal-voiced, were generally disliked by the men. They received little sympathy, burrows were purposely tramped down and adults were persecuted constantly. This was the only openly discussed form of deliberate destruction of adult birds we found, as irresponsible target shooting was done more or less on the sly and was not generally approved. Many Bonin Island Petrels were in areas desired for lawns and consequently were destroyed. Bulldozing in certain areas must have killed thousands of shearwaters and petrels in their burrows.

3. The destruction of eggs by factors already discussed and possibly by egg gatherers probably reduced the bird populations significantly. As mentioned in connection with Wedge-tailed Shearwaters, the collection of eggs for eating may be a serious matter. The extent of such collecting on Midway Atoll is unknown, but the practice was common throughout the Pacific. On small islands this one factor could mean extinction if it were to operate for several years.

4. The exigencies of war have resulted in the use of certain small islands for bombing and strafing practice (Green, 1942:16-17). Frequently these are small rocky offshore islands covered with bird rookeries. With the cessation of hostilities the justification for the continued use of small islands for targets should be reexamined. However, according to a news dispatch from Headquarters, AAF, dated September 8, 1945, a group of small islands off the coast of Oahu, T.H., is still in use as bombing and gunnery targets. In battle zones many of the islands have been more or less completely denuded of their flora and fauna. This was unavoidable, but the effect is nonetheless disastrous.

*Psycho-biological disturbance.*—1. Men walking through nesting colonies to take short-cuts or to see the birds caused almost continual disturbance. It is hard to conceive how the normal, complex breeding cycle could proceed effectively under extreme disturbance of this sort in such species as the colonial terns. The Sooty Terns in their colonies were posturing, defending territories, laying eggs and making a great noise throughout the day. This sight drew many watchers, and when one of them walked into a colony the terns would rise in a wheeling, squawking uproar.

2. Rats inadvertently introduced in 1943 destroyed large numbers of small birds and their eggs. Mice introduced at the same time probably exerted a much less drastic effect on the birds. Rat damage was greatly curtailed by an intensive poisoning and trapping program initiated on both islets in 1944, but the germ of a potential rat problem remains, as no means are available at present of completely eradicating them. Control measures must be maintained indefinitely on all bird islands where rats exist if the smaller birds are to survive. Since many of the Pacific islands offer no large quantities of vertebrate animal food other than birds and eggs, the pressure from increases in numbers of rats would be directly exerted upon bird populations.

3. Dogs and probably other domestic animals have complicated the ecological situation. Rabbits now kept in captivity may escape and cause additional damage. In view of the possibility of egg damage and psychological disturbance, and of the development in dogs and other animals of habits harmful to birds, it would be a wise policy to keep in force the pre-war practice of exclusion of mammalian pets.

4. Exotic birds in a way are an even greater threat than pets. As previously mentioned, it is a matter of far-reaching consequence to endanger the nesting grounds of oceanic birds by attempts to establish game birds and song birds. The environment on Midway is eminently unsuited to such birds; they require barnyard care to build up their populations. Another strong reason against introductions of bird species is that the oceanic birds are "the best entertainment we have on this island," as the Midway newspaper termed it, and attempts to augment the avifauna are not in the best interests of recreation. Unknown and unpredictable psycho-biological reactions between the birds are certain to take place, and some will be detrimental to the native birds. Resulting losses may far outweigh any recreational benefits afforded by such continental species as have been introduced.

5. Changes in plant life have resulted from extensive clearing followed by extensive replantings. Grasses, shrubs, and trees have been planted widely on Sand Island. Dense

vegetation may restrict the breeding of albatrosses, but it creates new sites for many other species. Grasses have been used extensively for sand stabilization; shrubs such as *Scaevola*, *Messerschmidia* (tree heliotrope), and *Coccoloba* (sea grape) have been set out on sand dunes, and ironwood trees have been planted in large numbers. Sand Island has many more exotic plants than Eastern Island, where the prevalent shrub is still *Scaevola*. In some areas it was noticeable that grass and underbrush were removed for landscaping and rat-control purposes. This removal destroyed the cover used by such birds as the Laysan Rail. As a whole, the changes have resulted in decrease of the bird populations during the past few years more than they have helped to increase them. When new plantings are established, however, the birds should be generally benefitted. A large-scale spatial readjustment of many bird colonies has been necessitated by the changes in the plant life and ground surface. Species unable to adjust rapidly have suffered.

### SUGGESTED MEANS FOR ALLEVIATING DAMAGE TO OCEANIC BIRDS

On militarily occupied islands, such as Midway, we think that the following measures, if carried out, would effectively reduce the loss of bird life.

1. Educate men to the recognition of companionship and interest inherent in the birds.
2. Protect breeding grounds from disturbance caused by over-clearing for construction, by vehicles running off roads, and by men watching the birds. Off-limit areas should be posted and the posting kept up-to-date as colonies settle down to breed.
3. Prevent introduction of rats and carry out a program of rodent control.
4. Prevent target shooting, egg gathering, and destruction of birds whenever possible.
5. Eliminate all unnecessary or unused pits and screen the necessary ones.
6. Remove flight hazards such as overhead wires, towers, and barbed-wire barriers when no longer needed.
7. Exclude exotic birds and mammalian pets.

On non-militarily occupied bird islands of importance we think that temporarily no recreational or economic use should be permitted until scientific and administrative surveys resulting in plans for bird protection can be completed. We suggest consideration of a permanent non-use policy for the more important bird islands such as Laysan, Lisiansky, Nihoa and probably others. Such a policy now appears to offer the only assurance for perpetuation of the endemic Hawaiian seabirds of the bird refuge on the leeward islands of Hawaii, and such a policy would still permit economic developments to be made, if desirable, on islands not important to bird life.

### SOME PROBLEMS CONCERNING SURVIVAL OF INSULAR BIRDS

W. K. Fisher (1903:8) noted the vast numbers of birds breeding on Laysan and their severe competition for surface area. There was a vertical as well as horizontal distribution of birds: petrels and shearwaters beneath the surface, terns, albatrosses, Christmas Island Shearwaters, and tropic birds on the surface, and boobies, some terns and frigates in the bushes above. Schauinsland (1899) earlier had noted that the seasonal distribution was an important factor in permitting the nesting of so many individuals of so many species. It is probable that on certain islands the horizontal, vertical, and seasonal distribution of the several species has arisen as an adaptation for survival, resulting from competition for breeding space. Populations on saturated islands are probably reduced in direct proportion to the extent of removal of space, vegetation, and soil from these islands.

Pan-oceanic breeders are naturally less likely to become extinct as a result of various disturbances than are birds breeding in only one archipelago. However, the activities of man are now so widely spread over the Pacific Ocean that even pan-oceanic island breeders should not be considered safe from destruction as species merely because they nest at widely separated localities. Careful and complete surveys are needed at present, as it would be impossible on the basis of information at hand to list all the islets and islands where the oceanic birds discussed in the foregoing accounts are breeding. The fewer the islands used by any one species of bird, the more actively should protective measures be put into effect for that species. We do not know what chance there is for any species, once exterminated from an island, to re-colonize it. We should watch the colonies of boobies at Midway with this in mind. Some poly-insular Hawaiian endemics needing extreme protection are the Hawaiian Black Noddy, the Laysan Albatross, and the Necker Island Tern.

Mono-insular endemics are in a precarious position. Immediate consideration should be given to transferring breeding stock of these species to other places to insure the continuance of the species. The species life of the Laysan Rail was prolonged some 20 years in this way without critical harm to any other birds on Midway. The Laysan Teal, Laysan Finch, Nihoa Finch, and Nihoa Miller Bird are mono-insular endemics which may still be in existence today.

Although there are seemingly large populations of certain species of seabirds at Midway, there is danger inherent in allowing breeding populations to decrease below certain unknown levels. Work elsewhere has shown that small colonies of some species are slower to breed and are less successful in nesting than are large colonies; when they are too much reduced, no breeding occurs. A psychological interdependence exists among many colonial birds that is apparently an important factor in the initiation and completion of the reproductive cycle. It is important that population data be gathered often enough to make it possible to discern downward trends in the numbers. Since the extinction of birds living in small, circumscribed areas may occur with great speed, such surveys should be started before post-war developments are undertaken on the leeward islands and should be repeated at frequent intervals. Just four years ago the Laysan Rail, the Laysan Finch and the Brown Booby were abundant on Midway.

Since 1940 the degree and rate of environmental change on Pacific islands has increased. War-torn islands of course have suffered most. News reports indicate that starving men on Wake Island ate all the gooneys they could get, and they ate rats too. Before the war a rail endemic to that one island existed, but with rats, bombings, and starving men, there is little hope that it still lives today. Midway also shared in the violence of war, but the bird life there has fared relatively well. From Midway we have learned in detail what may happen on islands used intensively by man, and we have learned that the need for complete protection for bird islands is now greater than ever before.

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*Department of Zoology and Entomology, University of Hawaii, and United States National Park Service, Hawaii National Park, Hawaii, October 2, 1945.*

# LIFE HISTORIES OF TWO PANAMANIAN ANTBIRDS

By ALEXANDER F. SKUTCH

In tropical America, a large and important part of the avifauna is made up of passerine birds of the suborder Tyranni or Clamatores, comprising eight or nine families. Of this immense group of birds, only a single family, the Tyrannidae or flycatchers, is well represented north of the Tropic of Cancer and hence is generally known to North American bird-watchers. South of the Tropic of Capricorn, in Argentina and Chile, the suborder is somewhat better represented by members of the ovenbird family (Furnariidae) and other groups, as well as by the wide-ranging flycatchers. Some of these birds were studied many years ago by W. H. Hudson (1920); his work on the "Birds of La Plata" is probably our richest single source of information on the habits of the Tyranni.

One of the largest families of the Tyranni is the Formicariidae, or antbirds. They are, all in all, the least specialized of the larger families of the suborder, lacking, so far as known, the peculiar courtship habits of many of the manakins, cotingas and flycatchers, the complex nest-architecture of so many of the ovenbirds, and the specialization of structure associated with tree-trunk foraging of the woodhewers. Since this family scarcely ranges beyond the tropics either to the north or south, little attention has been given to the life histories of its members. Some years ago I published a brief account of the nesting habits of the Slaty Antshrike, *Thamnophilus punctatus* (Skutch, 1934). The present paper is devoted to the habits of two additional species, both of which were studied on Barro Colorado Island in the Panamá Canal Zone.

## THE SPOTTED ANTBIRD

The Spotted Antbird (*Hylophylax naevioides*) dwells in the undergrowth of the heavy tropical forest from eastern Nicaragua southward through the Caribbean lowlands of Costa Rica to Panamá, Colombia and Ecuador. It is distinctively marked and easy to recognize, for its plumage is somewhat more boldly patterned than that of the majority of the inhabitants of the lowest stratum of the tall forest. The pure white breast of the male, crossed by a curving necklace of heavy black spots, immediately takes the eye and serves to distinguish him at a glance from any other bird of the forests where he dwells. His upper plumage is rich chestnut-brown, with the top of his head and hindneck gray, and the wing coverts are black boldly spotted with white. The female resembles the male, yet is easily distinguished by her buff-tinged rather than snowy white underplumage, her whitish rather than black throat, and the olive rather than solid black spots on her breast.

On Barro Colorado Island in the Canal Zone, the Spotted Antbird is abundant in the undergrowth of the forest, rarely ascending as much as six feet above the ground. Here it is most often seen hovering above the foraging swarms of army ants, in company with other small camp-followers of the destroying legions. Its frequent associates, or rather rivals for the morsels stirred up by the ants, are the Bicolored Antbird (*Gymnopithys bicolor*), the Sclater Antbird (*Myrmeciza exsul*), the McLeannan Antthrush (*Phaenostictus mcleannani*), the Gray-crested Tanager (*Eucometis cristata*), the Barred Woodhewer (*Dendrocolaptes sancti-thomae*), the Brown Dendrocincla (*Dendrocincla lafresnayei*), and at times even the Chestnut-headed Tinamou (*Tinamus major*).

As the deployed battalions of ants flow over and under the ground litter of fallen leaves and other debris of the forest, in the dry season creating an audible rustling,

every living creature able to creep, walk or fly scurries forth from its lurking place to make a dash for safety. These fugitives, spiders, millipedes, isopods, insects of many kinds, and even frogs, lizards and snakes, ordinarily are so well concealed that they can be discovered only through long and painstaking search, but they heedlessly expose themselves as they attempt to escape the ants. This is the birds' opportunity. About the van and the flanks of the hunting army, insect food is to be had with less careful searching, or less watchful waiting, than in almost any other part of the understory of the forest. Some of the forest birds appear to depend almost entirely upon the ants to stir up their prey for them, as the anis and other birds of the clearings take advantage of grazing domestic animals for the same purpose, or as men use hunting dogs. Among the almost constant followers of the army ants are the Spotted Antbirds.

As one follows in silence a trail through deep forest, the sylvan stillness will be broken suddenly by a chorus of mingled churrings, squeakings and trillings, sent up by a score of small, protesting voices, as the heterogeneous throng of disturbed camp followers melts away through the dim vegetation. Only the myrmecine hosts remain, grimly intent upon their plunder, blindly indifferent to bird and man alike. But if the intruder draws off a few paces and watches in silence, one by one the birds will come flitting back to their interrupted feast. Among the first to return are the Spotted Antbirds. One or several pairs may be present in a single gathering. Of all the motley feathered crowd, they are among the smallest and most active. Perching upon low branches, only a foot or two above the ground, or else clinging sideways to some slender upright stem, they intently watch the ground-litter, which is turned a deeper brown by the legions of ants swarming over and through it. Suddenly one of the antbirds flies down, snatches up a cockroach, a beetle or a spider as it abandons its hidden retreat in the face of the advancing army, quickly regains a low perch with its booty, then beats it against a twig and at last swallows it. Then it continues to perch quietly, close above the ground, peering down with bright black eyes, until another tempting morsel calls forth another quick descent among the ants. Whether the antbird devours small creatures with ants actually attached to them, I cannot tell. Apparently it is never interested in the ants themselves as food.

If a number of Spotted Antbirds be present, one will occasionally rush at another even when there seems to be sufficient food for all. The pursuer spreads the chestnut feathers of his back, revealing in their midst a conspicuous white patch ordinarily quite invisible. Such concealed areas of white are present in the backs or shoulders of a number of species of antbirds and becards, and like the similarly concealed patches of yellow, scarlet or white on the crowns of many American flycatchers are displayed in periods of excitement.

*Voice.*—The call of the Spotted Antbird is a high, sharp *psip*, or at times a short, soft *peep*. It also utters a low *churr*, a note of anger or alarm. It sings a high-pitched trill and at least two other songs, both delivered in a thin, dreamy voice that sounds far away even when the bird is close at hand. One may be paraphrased *peede weede weede weede weede weede weede*, the successive notes uttered slowly and slightly descending in pitch. The second sounds much like *peede peede peede peede sip sip sip sip*. I have heard the female reply with the *peede weede* song to the similar song of her mate. As with other antbirds, there is little or no difference in voice between the sexes. These songs, at best subdued utterances, are sometimes delivered in a whisper.

*Courtship.*—On March 22, 1935, while I sat quietly in my small wigwam of brown cloth in the undergrowth of the forest on Barro Colorado Island, watching a nest of the Red-headed Manakin, I had the good fortune to be approached by a swarm of small

army ants. Happily they did not, as has more than once occurred to me, invade my retreat and drive me forth, to put an end to observations. Among the attendants of the ants were a lone Chestnut-headed Tinamou, a lone Brown Dendrocincla, and a pair of Spotted Antbirds who appeared to be preparing to nest. The antbirds foraged in their habitual manner, perching from only a few inches to a foot above the ground on low horizontal twigs or upright stems, from which they made instantaneous darts down into the midst of the swarming ants. The male was most attentive to his mate, and time and again, when he secured a fine morsel, he called her to his side with low twitters and passed it to her. Their hunger satisfied for a while, they rested close side by side on a fallen dead branch and preened. When the buff-breasted female antbird again became hungry, she pecked gently at her mate's black bill, whereupon the two returned together to forage with the ants. They were rather silent, uttering only a low churr note, occasionally a sharp call, and once the *peede weede* song in an undertone.

Strong conjugal attachment seems to be characteristic of the genus *Hylophylax*. Some years later, in the dripping forests of the eastern foothills of the equatorial Andes, I watched a pair of antbirds belonging to an undetermined but rather closely related species. They resembled our Spotted Antbird in general appearance but were easily distinguished by the prominent white, black-margined spots on the brown back of the male; the spots were buff-colored in the female. The birds were following a swarm of army ants, snatching up small fugitives very much in the manner of their relatives farther north. Among their associates in the motley flock were a single spotted-breasted Nightingale-Thrush (*Catharus dryas*), and at least three other kinds of antbirds, including a pair of those most extraordinary representatives of the family, the White-faced Antcatchers (*Pithys albifrons*), predominantly rufous-chestnut in plumage, but with the head ornamented by a frontal crest of stiff, elongate, upstanding, white feathers arising at the base of the bill, and a moustache of similar white feathers. The male and female *Hylophylax,* when not actively engaged in catching insects, perched side by side on a fallen branch, only a few inches above the ground. There the male affectionately preened the plumage of his mate's neck. They called *peede peede peede peede,* many times repeated in a small, high voice, sounding very much like the song of *H. naevioides,* and they uttered sharp but weak monosyllables in measured cadence.

Courtship feeding has apparently never before been recorded in the antbird family. In addition to the Spotted Antbird, at least two other species have this habit. With the wide-ranging antwren *Microrhopias quixensis,* I have seen the black male give food to his slaty-backed, chestnut-breasted mate both in Panamá and in southwestern Ecuador. On Barro Colorado Island, I have seen a male Black Antwren (*Myrmotherula axillaris*) feed the female, and I have seen her return the courtesy.

*Nest and eggs.*—On Barro Colorado Island, the Spotted Antbird nests during April and May, normally the first two months of the rainy season. Its breeding, without much doubt, covers a longer period, but I have records of occupied nests only in these months. While I sat in a blind amid dense forest undergrowth on March 13, watching an incubating manakin, I found an unoccupied nest, apparently that of some kind of antbird. It was in a sapling off to my left, about three feet above the ground. The empty nest, a neat cup of black fibers, suspended by its rim in a horizontal fork, appeared newly made. In the course of a day it was visited by two male antbirds of different species. First, a male Slaty Antshrike (*Thamnophilus punctatus*), passing with his mate, paused to perch on the rim, where he uttered low, not unmusical churring notes. Later, when a pair of Spotted Antbirds came by, the male alighted beside the nest and whispered a pleasing little song, then went off and did not return. Neither the female Slaty Antshrike

nor the female Spotted Antbird gave any evidence of having noticed the nest. Since upon subsequent visits I never found it occupied, I did not succeed in proving its ownership. The episode illustrates the interest that male antbirds take in nests during the early part of the nesting cycle.

On April 18, I watched a pair of Spotted Antbirds build their nest. They had placed it in the fork of a horizontal branch of a small sapling, only about thirty inches above the ground, in the forest undergrowth. This same crotch contained the remains of an older nest, which had become partly detached from its support and hung by one side. The bottom of the new nest rested against the top of the older one. As with all the antbirds I have watched build their nests, male and female shared almost equally in the work. The male, however, did a little more than his mate; for, between seven and nine o'clock, he made nineteen visits to the nest, the female only thirteen. Although sometimes they flew up together with fibers in their bills, usually they alternated in their visits. Each placed and arranged the material it had brought; but the male seemed more careful in shaping the nest than the female. If one of the pair, flying up to the nest with fibers in its bill, found the other seated in the cup, it did not give these to the second, but waited beside the nest until the latter departed, then placed and arranged its own material. Either bird, arriving alone at the nest, called the absent mate with soft, short *peeps*. Sometimes the male antbird, as he sat in the cup with the female close at hand, sang in an undertone *peede peede peede peede, chip chip chip chip*. I did not hear him sing while he was alone at the nest.

At another time, when a swarm of ants with attendant small birds passed by this nest, still uncompleted, a Bicolored Antbird alighted for a brief period on its rim. The interest that antbirds take in nests not their own is doubtless responsible for some of the erroneous attributions of nests and eggs which appear in the literature of Neotropical ornithology. The nests of many forest birds can not be identified with certainty without watching them for considerable periods from concealment. Since collectors are rarely willing to devote so much time to nests, their records are not to be accepted without critical appraisal.

The three completed nests of the Spotted Antbird that I found on Barro Colorado Island were all situated in small saplings, among fairly dense undergrowth of the forest, at heights of 12, 28 and 30 inches above the ground. While the first was in the fork of a horizontal branch, the other two were suspended between two diverging branchlets which departed from the main stem at different levels. In one instance, one of the supporting branchlets was two inches higher than the other, and as a result one side of the nest was correspondingly higher than the opposite side. The structure was a deep, neatly made cup, attached by its rim in vireo fashion. One nest was constructed largely of brown, dry, thread-like pistillate inflorescences of *Myriocarpa izabalensis*, a widespread shrub or small tree belonging to the nettle family. In addition, there were fine brown fibers from other sources and an admixture of the tenuous black fungal filaments which creep over trunks and fallen branches in the undergrowth of humid tropical forests. Some fragments of dead leaves and twiglets were attached to the outside. This nest measured 2¾ inches in depth and 2½ inches in internal diameter. Another nest was quite similar in form and construction, but was black rather than brown in color from the abundance of the fungal hyphae in its composition.

The nest the construction of which I watched was found empty on the day after the first egg was laid. The two other nests each contained two eggs when I found them. Antbirds are as consistent as hummingbirds, and more consistent than pigeons, in laying sets of two eggs. Those of the Spotted Antbird are very heavily and rather uniformly mottled all over with umber, which covers half or more of the surface and is diffused

into the whitish ground color. Those of one set measured 23.0 by 15.1 and 23.0 by 15.9 millimeters.

*Incubation.*—In the middle of May, I found a nest with two eggs well advanced in incubation. It was situated one foot above the ground, suspended between two diverging branches of a little sapling and well screened by the hanging dead frond of a small palm growing close by. From a blind I watched this nest for the whole of one afternoon and all of the following morning. The record which was made seems of sufficient interest to present in full:

May 18, 1935, 12:10 p.m. I enter the blind. The nest is unoccupied, eggs warm.

1:06. The female silently goes on the nest.

3:13. The male calls *chip chip chip chip* from the undergrowth about twenty feet from the nest. The female at once leaves the eggs and flies in his direction. The male approaches the nest by flying from slender sapling to slender sapling; to the upright stem of each he clings, about a foot above the ground, and repeats the same little call. He circles around the nest and approaches from the other side, settles on the eggs, and calls *chip chip chip* twice more from the nest. Then he continues quietly to warm the eggs.

3:55. A shower begins.

4:30. The male spontaneously leaves the nest in a lull in the rain.

4:38. He calls from a sapling near the nest, then returns to the eggs and calls *chip chip chip* several times more. Soon the rain comes down hard again.

5:22. He leaves the nest.

5:44. The female approaches quietly and settles on the eggs, then calls *chip chip chip* several times over. The rain has stopped.

6:20. She leaves the nest.

6:30. She returns silently to the nest, in the fading light.

6:50. I leave the female on the nest, which I can no longer see.

May 19, 5:40 a.m. I return to the blind. As it becomes brighter, I see that the female is still on the nest.

6:05. She leaves.

6:19. The male comes on the nest, calling *chip chip chip* as before.

9:56. The male silently leaves the nest, then his mate silently takes his place.

11:55. A hard rain begins.

12:40. The female leaves the nest. The rain has slackened. I leave the blind.

As with a dozen other species of antbirds whose nest-life I have studied, male and female alternated on the eggs by day, the female attended the nest through the night. The diurnal sessions of incubation were long for birds so small, and with a single change of occupancy by male and female, they filled the morning or the afternoon. The male's separate sessions were, respectively, 77, 44, and 217 minutes; the female's, 127, 36, and 164 minutes, plus her long night session of 11 hours and 35 minutes. Counting only the diurnal period (1:06 to 6:30 p.m. on May 18, and 6:05 a.m. to 12:40 p.m. on May 19), the male covered the eggs a total of 338 minutes, the female 327 minutes, while the nest was unattended for only 54 minutes, of which 22 were accounted for by one long absence. As a rule, the male antbird covers the eggs or nestlings for somewhat longer periods by day than the female; but occasionally a nest will be found at which the female sits longer. This seems to be an individual rather than a specific difference. On the whole, the males among antbirds, as a family, are a little more zealous than the females in building, attending, and defending the nest.

With the loss of the only nest I had found before the eggs were laid, I was unable to determine the incubation period. The eggs of the Black Antwren (*Myrmotherula axillaris*) hatch in 16 days, those of the Bridges Antshrike (*Thamnophilus bridgesi*) in from 14 to 16 days; probably those of the Spotted Antbird will be found to require about 15 days of incubation.

When abroad in the forest, and especially when foraging with the army ants, the Spotted Antbirds are not particularly shy, but rather more confiding in the presence

of man than the majority of their feathered associates of the underwood. Yet at their nests they are exceedingly cautious; and it is difficult, without using concealment, to see them as they sit, or even to glimpse them as they steal unobtrusively away. I paid repeated visits to one nest without catching so much as a peep of its owners, until I hid myself in a tent of cloth and watched them feed their nestlings. At another nest, the male was somewhat bolder and perched about five yards away while I measured the eggs, repeating his little soft *peep* continuously so long as I remained in the vicinity.

*The nestlings.*—The eggs of one nest hatched on May 12. The nestlings were black-skinned, blind, and entirely devoid of down. In their nakedness they agreed with all other antbird nestlings I have seen except those of the Hoffmann Antthrush (*Formicarius analis hoffmannii*), which, strangely enough, are covered at birth with long, dark down, more than ordinarily copious for a passerine bird. They were fed and brooded by both parents and developed very rapidly. At the age of a week their feather-sheaths began to be prominent on the body, while those of the remiges were already long. Soon the little antbirds bristled with long, dark-colored pin-feathers. The sheaths, after reaching full length, were rapidly shed, leaving the nestlings completely clothed with feathers by their tenth day. On the eleventh day, their nest was empty, and although I failed to find the fledglings in the vicinity, I think it probable that they had survived. Eleven days is the approximate nestling period I found for two young Tyrannine Antbirds (*Cercomacra tyrannina*). The bigger Red-eyed Antshrikes (*Taraba major*) and Barred Antshrikes (*Thamnophilus doliatus*) linger in the nest 12 or 13 days if undisturbed. But I have actually watched a fully feathered young Bridges Antshrike hop from its nest and vanish through the undergrowth, quite spontaneously and undisturbed, at the age of 9 days and 22 or 23 hours; its younger brother followed the next morning at a slightly more mature age, not less than 10 days and 1 hour, nor more than 10 days and 19 hours after it hatched. Slaty Antshrikes (*Thamnophilus punctatus*), too, may spontaneously leave the nest, well feathered, when approximately 9 days old.

### THE BLACK ANTWREN

The Black Antwren (*Myrmotherula axillaris*) inhabits lowland rain-forest from southern Honduras to Bolivia and eastern Brazil. In Central America, north of the Isthmus of Panamá, it seems to be confined to the more humid forests of the Caribbean side, where it ranges from sea-level upward to at least 1500 feet. Carriker (1910:608) questions the validity of two supposed records of this species from the Pacific coast of Costa Rica.

These little antwrens are among the smallest of birds, measuring slightly over 3½ inches in total length. The male is almost wholly black, with white spots on the wing coverts and the tips of the rectrices. When he lifts his wings, he reveals a conspicuous area of long, soft, white feathers on each flank. He has also, in common with other members of the genus, a narrow white band on each shoulder, which is rarely displayed. The dorsal plumage of the female is olive, becoming gray on the head; her under parts are buff. She is a very plainly colored little bird, easily confused with other species among which she dwells.

None of the antbirds that I know frequents the tops of the higher trees. The forest-dwelling species remain well below the canopy, in the deep shade cast by the crowded lofty crowns of the forest giants. The Black Antwren is one of the higher-ranging of the forest antbirds, seldom foraging on the ground or through the lowest stratum of vegetation, yet at the same time avoiding the lofty upper stories. It probably spends most of the day between six and forty feet above the ground, in the tops of the shrubs and among the lower branches of the taller trees. Here it hunts among the foliage much in

the manner of a warbler, flitting from branch to branch and hopping along the finer twigs, inspecting leaves and bark for small insects and spiders, and sometimes darting out to snatch some tiny flying creature from the air. Like other members of the family, the Black Antwren is largely if not wholly insectivorous. As he flits from branch to branch, the male Black Antwren alternately exposes and conceals the white patches on his flanks as he spreads and folds his wings.

In the lowland forests of Central America where the Black Antwren dwells, there are no resident, arboreal warblers. The rôle which these birds play in the economy of the woodlands of the temperate portions of North America and the more elevated regions of tropical America is here largely taken by the smaller and more arboreal of the antbirds. In the forests of central Panamá, the three antbirds which most resemble the wood warblers in their manner of foraging are the Black Antwren, the Lawrence Antwren (*Myrmotherula fulviventris*), and the Panamá Antwren (*Microrhopias quixensis virgata*). These three species often flock together, roaming through the forest in mixed parties even in March and April, when some at least of each kind are nesting. Frequently they are accompanied by other small birds, such as *Xenops minutus*, which finds much of its food inside small decaying twigs. In the spring, when warblers are passing northward through these forests, they may temporarily form part of the mixed flocks in which the Black Antwren forages.

The notes of the Black Antwrens, although frequently voiced, are weak and of an indescribable tonal quality. Little chirps, twitters, and low churrs are the only utterances I have heard from them.

*Courtship.*—At about four o'clock on the afternoon of February 10, 1935, in the undergrowth of the forest on Barro Colorado Island, I came upon a party of Black Antwrens, a male and two females, who behaved most oddly and seemed to be engaged in a courtship ceremony. Perching upon low twigs, usually between two and ten feet above the ground, they continually uttered a weak little call, or possibly it should be considered their song, consisting of two syllables. While calling they flitted their wings, raising them one at a time, with a very rapid motion, and closing them just as quickly. The movement was so rapid that it was difficult for the human eye to follow. As they lifted their wings, they turned rapidly from side to side, or about-faced on the perch and frequently flitted from one twig to another. The male and the females behaved in the same fashion; but the latter were more active both in calling and exercising their wings. In the male, the lifting of the wing revealed momentarily the long, white feathers of the flanks, which are practically concealed when the wings are folded; but the females, although they so assiduously moved their wings, had no similarly conspicuous plumage.

The birds continued these antics for about half an hour, moving about through a small area of undergrowth. The several actors never came very close together nor performed in any definite spatial relation to each other. One of the females voiced a low, rapid, churring call. The lifting of the wings by the male Black Antwren to expose the white feathers on his flanks may be compared with the Panamá Antwren's habit of spreading the black feathers of his back to reveal the snowy area in their midst, as he courts the female. Antbirds with concealed areas of white in their plumage generally display them at times of excitement, as in courtship, in disputes among themselves, and when trying to entice an intruder from the vicinity of their nests.

That the female Black Antwren may take the more active part in matters of courtship was likewise suggested by another observation I made two months later, also in the forest on Barro Colorado Island. On the morning of April 5, while I sat in my blind

watching a Brown Flycatcher (*Cnipodectes subbrunneus*) build her nest, a flock of small antbirds wandered through the forest above my head. Among them was a pair of Black Antwrens. When they were directly above me, I saw the female give the male an insect she had caught. The male was in adult plumage. Among other species of antbirds, as indeed among birds of all kinds of which one member of the pair feeds the other, it is more usual to see the male feed the female. But some years later, I watched a female Cabanis Euphonia (*Tanagra luteicapilla*) surrender to a male in fully adult plumage a caterpillar she had just found. Lack (1940:170) gives additional instances of female birds feeding their mates.

*Nest and eggs.*—The only nests of the Black Antwren that I have seen were on Barro Colorado Island. The first of these was found on March 29, 1935, when nearly completed, and contained its full set of eggs by April 3. The second was discovered with newly hatched nestlings on April 16; and in the third, incubation was in progress during the second week of May, after which the eggs were destroyed by some small predator. Cherrie (1916:282) found the nest of another race of this species at Maipures on the Orinoco River, in January, when it contained eggs. These four are the only records of the nest of the Black Antwren that have come to my attention.

I was not able to watch the building of the nest, as those which I found were nearly or quite completed; but from analogy with other antbirds, it is hardly to be doubted that the male takes a substantial part in this work. As we shall see, he performs a large share of the incubation; and when the male bird incubates, it is almost axiomatic that he aids in building the nest and caring for the nestlings.

Cherrie's nest was placed at a height of seven feet above the ground in the midst of a thick tangle of overhanging bamboo branches in the undergrowth of high, dense forest beside the Orinoco. My three nests on Barro Colorado Island were all considerably lower. The highest was four feet up, in the crotch of a slender bush, shaded by a palm leaf. The second was 28 inches above the ground, suspended between the petioles of two diverging leaves of a climbing aroid, well concealed by the foliage. The lowest was only 22 inches up, in a small sapling, beside a nearly dry stream bed. All were in heavy forest.

The nest is a deep, well made cup, attached by its rim to the arms of a slender, horizontal, forking branch, or in some similar position, as between petioles conveniently placed. A typical structure was composed chiefly of pieces of dead and partially decayed leaves, some completely skeletonized, bound together and attached to its supports by long, black fungal filaments. In the bottom there was a thin lining of these same black fibers. The nest described by Cherrie was apparently quite similar in construction to these on Barro Colorado Island; in this instance the component leaves were chiefly bamboo, the kind most readily available to these birds that built in a bamboo thicket.

Two of my nests contained two eggs each, the third, two nestlings. The eggs were white, speckled with reddish-brown or chestnut; most or all of the spots were gathered in a wreath about the large end. The four eggs measured 16.7 by 12.3, 17.1 by 12.3, 17.5 by 12.7, and 17.5 by 12.7 millimeters. At one nest, an interval of two days separated the laying of the first and second eggs. At this nest the male antwren was found incubating at 8:45 on the morning when the second egg was laid, indicating that incubation begins promptly upon the completion of the set.

*Incubation.*—The first and lowest of my nests was found on March 29, 1935, when nearly completed. On April 2 there was a single egg, which possibly had been laid the preceding day; the second and last egg was deposited on April 3. On April 11, shortly before noon, I began a study of the antwrens' mode of incubation from a blind which had already been in place for two days. This is the record of the birds' activities:

April 11, 1935, 11:50 a.m. I enter the blind without disturbing the male antwren, who is sitting.
2:44 p.m. He silently leaves the nest.
3:03. The female silently approaches and goes on the nest.
5:23. The female leaves and joins her mate. I hear their voices in the distance.
5:48. The male silently goes on the nest.
6:08. The female quietly replaces the male on the nest.
6:45. I can no longer see the nest, and leave the blind in the dim light.
April 12, 6:00 a.m. I return to the blind.
6:10. The female darts from the nest. The light is still very dim in the forest.
7:44. The female returns to the nest.
9:22. The male flies down to the nest, displaying his usually concealed white shoulder bands as he alights beside it. The female leaves, calling in her queer tones as she disappears among the foliage.
9:25. In response to his mate's repeated calls, the male leaves the nest and follows her.
9:36. The male returns to the nest, again showing the white under-feathers on his shoulders as he alights beside it.
11:52. Hearing the calls of the female in the distance, the male leaves to join her.
12:21. The female silently goes on the nest. I leave the blind.

This vigil at the antwrens' nest revealed certain features so unusual for antbirds that I decided to watch again the following morning. A fairly hard shower had fallen during the latter part of the night, and when I went out into the forest before dawn I found it dripping.

5:55 a.m. I enter the blind. A few minutes later a transient shower falls.
6:12. The bird who has been covering (probably the female, but it is still too dark to see) suddenly leaves the nest.
8:05. The female suddenly and silently returns to the nest.
8:26. The male replaces the female in the same manner as at 9:22 yesterday.
8:40. I leave the male on the nest.

The little cup-like nest was so deep that only the bill and the tail of the incubating birds were visible to me as I sat in the blind, with my eyes somewhat above their level. At the distance from which I watched them, in the subdued light beneath the big espavé tree that spread its massive boughs overhead, I could detect little difference in the colors of the tails of the male and female; but the male was always to be recognized by the white tip of each tail feather, which the female lacked. Both members of the pair always sat facing outward from the fork that supported the nest. This position is typical of antbirds of a number of species. Yellow-green Vireos (*Vireo flavoviridis*), on the other hand, regularly face inward as they incubate.

Incubation by the female during the night, and of both sexes alternately during the day, is the rule among antbirds. The surprising feature revealed by the study of this pair was the long periods of neglect, when the eggs were allowed to become thoroughly chilled while both parents roamed through the forest. Other antbirds that I have studied have kept their eggs far more constantly covered. Indeed, it is rare for any small bird to neglect its eggs for such long periods as these, and especially so when the two sexes share the responsibility of keeping them warm. On both April 12 and 13, the female, instead of waiting for her mate to come and replace her, darted from the nest soon after daybreak, while the light was still very dim beneath the high forest canopy. On the first morning, she remained absent for 94 minutes; on the second, for 113 minutes. On both mornings she returned alone to resume charge of the eggs that had been so long neglected, and only after she had been sitting for some time—98 minutes on April 12, 21 minutes on April 13, did her mate come to relieve her. During the remainder of the day, the interruptions to incubation were far shorter than that which started off the morning; the periods during which the eggs were left uncovered were no longer than with many small birds of which the female incubates without assistance from her mate.

Despite their periodic neglect of their eggs, the Black Antwrens were by no means restless sitters, for they remained on the nest for two or three hours continuously, which is long for such small birds. The occasional interruptions of incubation appeared to be caused by the antwrens' strong sociability and the insistence of the male and female upon foraging in company. This desire for companionship was well illustrated at 9:25 on the morning of April 12, when the male left the nest upon hearing his mate's calls, only three minutes after he had replaced her there. Following her, he remained absent for eleven minutes, then returned to the nest. At 5:23 p.m. on April 11, and again at 11:52 a.m. the following day, the calls of the mate also appeared to be responsible for drawing the sitting antwren from the eggs before relief arrived; but in each of these instances the bird had been on duty continuously for well over two hours. Most other kinds of antbirds forage alone during the period of incubation.

Since antwrens are not known to be active during the night, the records for April 11 and 12 give a continuous picture of events at the nest during slightly over 24 hours. The period of diurnal activity may be considered to extend from 6:10 a.m. to 6:08 p.m. The male took four sessions on the nest, ranging from 3 to more than 174 minutes, and averaging 83+ minutes. The female, in addition to the long night session, took two diurnal sessions, of 98 and 140 minutes, averaging 119 minutes. In the period of diurnal activity, the male covered the eggs for 333 minutes, the female for 238 minutes. The eggs were left unattended for five periods, ranging from 11 to 94 minutes in length, and totalling 178 minutes.

At the second nest with eggs, the pair likewise neglected them for long periods. Incubation at this nest began on May 7, and the following record was made on the morning of May 12:

5:45 a.m. I enter the blind.

5:58. While it is still too dark to distinguish things clearly in the forest, the bird which spent the night on the eggs leaves the nest.

7:28. The male goes on the nest, which has been left unattended for an hour and a half.

9:42. The male spontaneously leaves the nest, calling as he flies off into the woods.

10:57. The female approaches silently and alone; she goes on the eggs, which have been left deserted for an hour and a quarter.

11:30. The female is still on the nest. I go.

A brief record made at a nest of the Lawrence Antwren, which was despoiled before I could complete my study of it, suggested that these birds likewise leave their eggs unattended for considerable periods while male and female forage in company. But most antbirds keep their eggs far more constantly covered, as may be seen in the following table. At all of these nests, the birds, watched from a blind, were not interrupted and appeared to be quite at their ease while they incubated.

| Species | Hours watched | Per cent time on eggs |
|---|---|---|
| Hoffmann Antthrush (*Formicarius analis*) | 6 | 100.0 |
| Red-eyed Antshrike (*Taraba major*) | 11½ | 96.4 |
| Slaty Antwren (*Myrmotherula schisticolor*) | 6 | 93.9 |
| Spotted Antbird (*Hylophylax naevioides*) | 13 | 92.4 |
| Black Antwren I (*Myrmotherula axillaris*) | 13 | 76.2 |
| Black Antwren II | 5¾ | 50.3 |

At the first and lowest nest, the male sat far more steadfastly than his mate. He would remain on the nest while I approached and bent over him. As the eggs neared the point of hatching, he would linger upon them until my slowly advancing hand was less

than a foot distant, then jump from the nest and fly slantingly downward until he almost touched the ground. But he never permitted me to touch him. His more wary mate would always desert her eggs to dart rapidly away and vanish while I was still several yards distant.

At this low nest, the set of two eggs was completed on April 3, and both hatched on the 19th, giving an incubaion period of 16 days. The eggs in the other nest were destroyed before they hatched.

*The nestlings and their care.*—The newly hatched antwrens were pink with blackish heads and were devoid of the slightest trace of natal down. Their eyes were tightly closed, and the interior of their mouths was yellow. They were typical antbird nestlings and developed very rapidly. On April 22, when three days old, their eyes were opening and their sprouting pin-feathers were already long. On April 25 the feathers were beginning to escape from the ends of their sheaths. The following day the nest was empty. It is not impossible that the week-old antwrens spontaneously departed their cradle; but I think it safest to await additional evidence before concluding that the nestling period of this species is only seven days. The Slaty Antshrike (*Thamnophilus punctatus*) and the Northern Antvireo (*Dysithamnus mentalis*) both have a nestling period of nine days, but some of the larger species remain in the nest a few days longer.

On the morning of April 23, when the nestlings were four days old and bristling with long pin-feathers, I spent four hours (6:00-10:00 a.m.) watching their nest from the blind set in its former position. During this period the male brought food seven times, the female six. So far as I could determine, the nestlings' food consisted entirely of small insects. The female brooded thrice, for 3, 26, and 35 minutes, a total of 64 minutes. The male brooded once for 7 minutes, and at another time lingered upon the rim of the nest, guarding, for 6 minutes, before he settled down to brood, just as I was preparing to end my vigil. While the female antwren was sitting in the nest, some birds foraging in the crown of the big espavé tree above it knocked down a small dead branch which crashed to earth only a foot away from her. But she did not stir from her position. She continued quietly to brood while the fruits shaken down from above fell all around her.

Upon leaving the blind at ten o'clock, I advanced toward the nest, in which the male antwren had just settled down to brood after guarding for six minutes upon the rim. I bent over until my face was only a foot from his. The bird lifted his head and looked up at me with steady black eyes, but did not desert his post until I advanced my hand in an attempt to touch him. Before I could do this, he jumped from the nest, dropped to the ground, and skimmed rapidly over it for a distance of about twenty feet. Then he rose into the bushes and called for a long time, uttering a sort of chittering in his indescribably queer tones. His mate answered from a greater distance.

This male antwren's simulation of the actions of an injured bird was not nearly so convincing as that I had witnessed a few days earlier with the female of the second nest. This was situated four feet above the ground, and when found on April 18 it contained nestlings very recently hatched. Two days later, I twice found the female brooding when I visited the nest. Each time she sat until I came within a few feet of her, then dropped suddenly to the ground, and dragged herself over it for many yards, as though unable to fly. I have seen few birds convey more convincingly the impression that they were severely injured and trying frantically to escape. When she had led me a good distance from the nest, she flew up into the bushes and joined her mate in uttering the queer calls characteristic of her species. Many other kinds of antbirds also feign injury when their nests appear to be in danger.

This nest was empty eight days after I found it with newly hatched nestlings, again suggesting a very short nestling period. But so many nests in the lowland forests of the tropics are despoiled by predatory animals that again I was not certain that the young antwrens departed spontaneously.

## SUMMARY

The Spotted Antbird (*Hylophylax naevioides*) and the Black Antwren (*Myrmotherula axillaris*) inhabit the same heavy lowland rain-forests on the Isthmus of Panamá, but they occupy different ecological niches. The Spotted Antbird dwells in the lowest stratum of the forest, rarely ascending as high as six feet above the ground. The Black Antwren forages chiefly among the lower branches of the big trees and the tops of the bushes, from about six to forty feet above the ground.

Both these antbirds are largely if not exclusively insectivorous and were not seen to eat fruits of any kind. The Spotted Antbird was most often seen following army ants and picking up insects, spiders, and other small creatures that these ants drive from concealment as they hunt. It shows no interest in the ants themselves as food. The Black Antwren forages among the foliage in the manner of a small, active wood warbler.

The Black Antwren has a peculiar courtship performance. Males and females gather in the undergrowth of the forest and rapidly lift and lower their wings, an act which, in the case of the male, reveals the long, conspicuous, silky, white feathers of the flanks. At the same time they turn rapidly from side to side and call incessantly with squeaky notes.

The males of both the Spotted Antbird and the Black Antwren feed their mates during the period of courtship. Once a female Black Antwren was seen to feed a male in adult plumage. Courtship feeding by the male has been witnessed in still a third species of the Formicariidae, *Microrhopias quixensis*.

The nests of both the Spotted Antbird and the Black Antwren are small open cups attached by their rims, in vireo fashion, to two diverging branches in the undergrowth of the forest.

A nest of the Spotted Antbird was built by both sexes, the male performing a slightly larger share of the work than the female. In five other genera of antbirds the nest was built by both sexes working together.

Two nests of the Spotted Antbird and three of the Black Antwren contained each two eggs or nestlings. In the antbird family, the full set seems always to consist of two eggs.

In both the Spotted Antbird and the Black Antwren, as with a dozen other species of the Formicariidae watched for longer or shorter periods during the course of incubation, the sexes alternated on the eggs during the day. In the Spotted Antbird and the Black Antwren, individual sessions on the eggs tended to be long, ranging up to three hours or more of continuous sitting by day. During thirteen hours of observation, a pair of Spotted Antbirds together kept their eggs covered for 92.4 per cent of the time. But the Black Antwrens neglected their eggs to a degree which seems exceptional in the Formicariidae. At one nest, watched for thirteen hours, the pair spent only 76.2 per cent of the time on the eggs; at a second nest, watched for 5¾ hours, the eggs were covered only 50.3 per cent of the time.

With both species, the female incubates during the night.

At one nest of the Black Antwren, the eggs hatched in sixteen days.

The newly hatched nestlings of both the Spotted Antbird and the Black Antwren are blind and completely naked, as are the nestlings of all other antbirds, so far as

known, except in the genus *Formicarius*, in which the nestlings at birth bear a covering of down unusually copious for a passerine bird.

With both the Black Antwren and the Spotted Antbird, the nestlings are fed and brooded by both parents. So far as seen, they received only insect food.

One of the female Black Antwrens gave an unusually convincing display of "injury-feigning" when driven from the young nestlings she was brooding. Such displays have been witnessed among other species of antbirds.

The development of the nestlings of both the Black Antwren and the Spotted Antbird was very rapid, that of the former species somewhat the faster. The feathers of the young Black Antwrens began to escape from their sheaths on the sixth day after hatching, and on the following day the nest was empty. The nestling Spotted Antbirds were clothed with feathers on the tenth day, and the following day their nest also was empty. Although in neither instance could the young birds be located after their disappearance from the nest, it seems likely that they left in safety, the Black Antwrens when seven or eight days old, the Spotted Antbirds when eleven days of age. These nestling periods are about the same as those of other species of antbirds for which definite nestling periods have been established by watching departure of young of known age.

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*Finca "Los Cusingos," San Isidro del General, Costa Rica, August 1, 1945.*

# THE ECONOMIC STATUS OF FLOCKING BIRDS

By W. L. McATEE

While not one of those who viewed the Passenger Pigeon in its glory, the writer has seen flights of other birds that stretched from horizon to horizon, as geese in Louisiana and blackbirds in Texas. The span of such a local horizon is not great, yet a broad, many-ranked flock of birds straggling across it comprises a vast number of individuals. There are enough of the blackbirds, one thinks, to clean up quickly all of the grain in a ricefield. That this does not happen more often appears to be a dispensation of fate as the possibility of total consumption of a crop is ever present. When there still were a few rice plantations in the Bobolink's autumnal flyway along the South Atlantic Coast, the writer saw hordes of these apparently insatiable "rice suckers" attack the grain so pertinaciously it seemed that every kernel would be milked. Only the most active and persistent defensive efforts enabled the planters to save a worth-while part of the crop.

The case of the Bobolink is, perhaps, an extreme example, but the fact remains that flocking species are responsible for most of the economic losses caused by birds. Thus the Division of Economic Ornithology and Mammalogy, forerunner of the Biological Survey, gave much attention in its early years to the depredations of ricebirds, blackbirds, the English Sparrow, Cedarbird, and the Crow. Among the publications it was deemed expedient to issue in the first score of years, those on the "Food of the bobolink, blackbirds, and grackles," "The relation of sparrows to agriculture," and "The horned larks and their relation to agriculture" dealt with typically flocking birds. The first release devoted chiefly to "control" of a bird was "How to destroy English sparrows" (1910). The discussion which follows is based largely on data contained in leaflets in the wildlife series issued by the Biological Survey and the Fish and Wildlife Service.

As time went on, demands for assistance in bird control increased but it remained evident that in most instances flocking species were at fault. Among them was the Piñon Jay, bands of which emerge from their usual haunts, the piñon-juniper covered hills, to damage near-by fields of grain. Of the White-necked Raven we read, "It is the gregarious habits . . . that make it capable of inflicting damage to unharvested crops," particularly grain sorghums, corn, melons, and peanuts. Horned Larks, especially in California, damage vegetable and seed crops in their early stages when the population of the birds in the farming valleys is increased by influx of old and young after the breeding season in the surrounding foothills. Unusual culprits are the flocks of shore-feeding Herring Gulls that sometimes leave the beach and ravage the blueberry crop in Maine, and the Cape May and Tennessee warblers, ordinarily highly insectivorous, which puncture grapes to a serious extent when collected in numbers on their southward migrations. It is, of course, flocking birds that become obnoxious by roosting where not wanted and whose objectionable presence has called for much study as to means of dislodging the roosts or destroying the birds. These comprise chiefly Starlings, blackbirds, and feral pigeons, but sometimes also such more desirable species as Purple Martins and Robins. Continued attention to depredation on grains by blackbirds has been required and special groups of birds in California have occasioned losses so great that organized study and cooperative control have been necessitated.

Again these are mostly flockers, including the blackbirds and Horned Larks, previously mentioned, the House Finch which attacks buds, fruit, and even grains, and the

crowned sparrows, injurious to young garden and ornamental plants and to buds and blossoms. Waterfowl, so well known as flocking birds, in their recently increased numbers have committed agricultural damage in various parts of the country, as to rice in California and Arkansas, lettuce in Washington, corn in Colorado, and buckwheat in Michigan. Control of these game birds has included not only the use of a variety of frightening devices but also the opening of special seasons in which the birds could be shot. Similar treatment of Band-tailed Pigeons has been required because of their depredations upon cherries.

Sometimes economic loss results from the activities of local populations of very common birds, as through small fruit eating by Robins and Starlings in the East and of the rice depredations by the colony-nesting Tricolored Blackbird in California. In plain language suiting all these cases, there are too many birds of one kind in one place. But remedies also should be local and corrective rather than sweeping and vindictive.

But is there not another side to this matter? Indeed, there is, for as the flocking birds can do great harm by feeding on crops, they can also do great good by preying upon injurious insects. Illustrative discussion may be found in papers by the writer in the Annual Report of the Smithsonian Institution for 1920 and 1925 and by others in leaflet number 224 of the series mentioned above. It was flocks of California Gulls, for example, that saved vital crops for settlers in Utah from ravages of the Mormon cricket—a rescue that won for these birds the unparalleled recognition of commemoration by monument. Meadowlarks have rendered similar aid against the related coulee cricket in Washington State. Infestations of canker-worms in California have been wiped out by flocks of Brewer Blackbirds and of climbing cutworms by Crows. In Manitoba, it was recommended that farm practice be planned with the view of best utilizing the services of birds in destroying white grubs—a remarkable tribute to the utility of birds, including gulls, terns, crows, and blackbirds, which were found to destroy 90 per cent of the write grubs exposed by plowing. When the Rocky Mountain locust was so serious an enemy of the crops of early tillers of the Great Plains region, gregarious birds, especially the Yellow-headed and other blackbirds, utterly destroyed the pests locally. In recent times, outbreaks of other grasshoppers in the same region have been subdued by mass attack of Franklin Gulls. In North Carolina, the writer found flocks of native sparrows removing "green bugs" or wheat aphids at the rate of a million a day on a single farm. Among the most effective enemies of the leaf-tier and other insect depredators in the commercial, celery-growing region of Florida have been such flocking species as Tree Swallows, Red-winged Blackbirds, and Bobolinks.

In reading these names of bird friends, we note several that were previously indicated as foes, but that is the way of the relations of birds to man. There is usually no clear-cut, dividing line between ally and enemy. Time, place, and the number of birds involved are great modifying factors. The birds take advantage of conditions for their own good, not for ours, and it is up to us so to plan as to reduce their harmful, and increase their useful, effects by all practicable means.

In summary, the special economic status of flocking birds results from concentrations. Assuming the same food habits, depredations by scattered pairs are scarcely noticed, but those involving the multiplied impact of flock feeding upon a valuable crop can be disastrous. The very fact of flocking, involving desertion of large, and concentration in smaller, areas may result in harm being done where no good is accomplished by the same species. The person suffering loss thus feels he is being attacked by an alien invader. There should be some give and take, however, as his birds may have joined flocks that will harass a distant planter, and on the other hand he may be benefitted by

timely attack on some insect pests by birds that have gathered in from a great area. Some form of crop insurance might serve to equalize losses and make them easier to bear.

In any event, it should be remembered that if we destroy birds, we can no longer count on their help in the warfare against insects. Hence, control should always be limited as to locality and season and should be carried out in so reasonable a manner as not to threaten the existence of birds, which although at times vexatious pilferers, at other periods are industrious helpers.

*United States Fish and Wildlife Service, Chicago, Illinois, October 22, 1945.*

# THE LUCAS AUK APPEARS AGAIN

By LOYE MILLER

Just at the turn of the century there appeared the first published record of a fossil bird from the state of California, *Mancalla californiensis* (Lucas, 1901), represented by a fragment of the humerus. Three years later Sinclair (1904) devoted one clause of a single sentence to birds in a report on his exploration of Potter Creek Cave (Pleistocene) in Shasta County. This cavern bird material remained in the collections of the University of California without further attention until the rich deposits of Rancho La Brea revived the subject of paleornithology within the state. During the succeeding thirty years, better than a hundred thousand bird bones have been retrieved from thirty or more localities and a dozen different workers have contributed to the literature of California's fossil birds. The Lucas Auk thus occupies historically a dignified position at the head of a long train of followers.

In 1933 a second specimen of the humerus of this species was retrieved from strata of Pliocene age at San Diego (Miller, 1933). This poorly preserved fragment threw no new light upon the species but it did serve as the stimulus for a careful examination of the type through the medium of a well made cast. The specimen fortunately retained that peculiar relation of the capital groove to the ligamental furrow that I have seen duplicated in no other bird humerus. The identity seems unquestionable and the presence of *Mancalla* in the marine beds at San Diego, one hundred and forty miles to the southward of the type locality, Los Angeles, is of service to paleontology in determining the age of these strata.

By great good fortune we now have a second humerus from the Pliocene beds of San Diego, a specimen that is complete and but slightly water-worn. This bone gives us for the first time the characters of the elbow joint, a part that is lacking in the type specimen. Needless to say, this new find was welcomed with great enthusiasm.

The bone, together with other fragments of the same and other species, was picked up by Mr. John Squyres of San Diego, who very generously donated the material to the University of California at Los Angeles. I would here record my indebtedness to Mr. Squyres, to Director Clinton G. Abbott of the San Diego Museum of Natural History, who brought the material to my attention, and to Dr. Hildegarde Howard, who has contributed valued suggestions and criticism.

*Nature of the deposit.*—The material here discussed comes from two separate exposures resulting from road cuts in the Mission Hills district of San Diego. The Reynard Way exposure lies on the east side of that highway five hundred yards south of its intersection with Sutter Street. The Five Points Freeway exposure lies on the south side of the freeway beginning one-fifth of a mile west of the intersection of Washington Boulevard and Hawk Street. This exposure runs along the south bank for most of the length of the freeway.

The matrix is a clean gray sand of fairly uniform texture, free from ripple marks or cross bedding, thus indicating water well out from the immediate shore line. Occasional small stones that occur were certainly not water borne but may have come from sea lion stomachs or from kelp holdfasts. The several bones from the one species of diver could not therefore be the result of a rookery accumulation, although there must have been such a rookery on some not far distant islet from which remains were swept to be scattered over the adjacent sea bottom. Bones of whales and seals and teeth of sharks and rays occur abundantly in the same stratum as the bird remains. Some species of typical

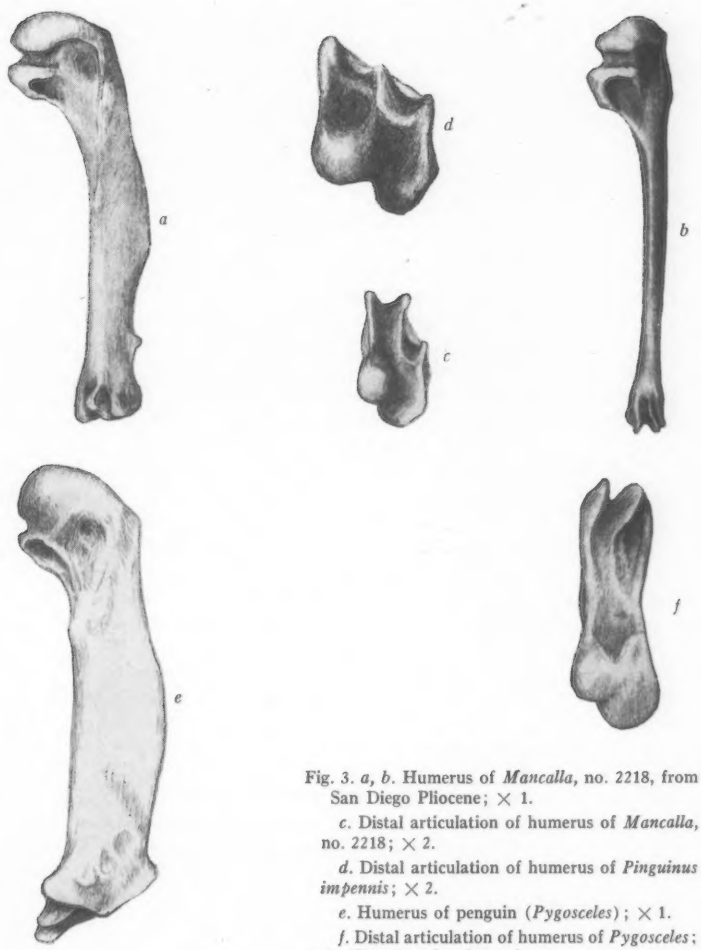


Fig. 3. *a, b.* Humerus of *Mancalla*, no. 2218, from San Diego Pliocene; × 1.

*c.* Distal articulation of humerus of *Mancalla*, no. 2218; × 2.

*d.* Distal articulation of humerus of *Pinguinus impennis*; × 2.

*e.* Humerus of penguin (*Pygosceles*); × 1.

*f.* Distal articulation of humerus of *Pygosceles*; × 2. (Drawings by the author.)

alcid, a cormorant, and a gull are indicated by other fragments in the collection. Also there is a complete femur that is practically identical with the type specimen of *Pliolunda diegense.*

*Study of the remains.*—The complete humerus of *Mancalla* came from the Reynard Way cut. Most of the fragments were taken at the Five Points Freeway exposure. The complete bone comes from a smaller bird than did the type specimen and it shows certain osteological divergences. Fragments came from larger birds, but none quite reaches the size of the type. These differences are not beyond the amplitude of age and sex variation in some living species of high variability, although it must be conceded

that a smaller form than *californiensis* may possibly be represented. In this connection it may be noted that Grant and Gale (1931:40) place the San Diego beds at a slightly earlier stage of the Pliocene than the Los Angeles stratum that yielded the type. Possibly *Mancalla* was a variable species that was moving toward gigantism.

The type specimen lacks the distal condyles but the peculiar epicondylar tubercle is preserved. Measuring from this tubercle to the extreme profile of the caput humeri gives us a length of 62.1 mm. The same measurement in the San Diego specimen is 54.3 mm. The ratio of these two figures is 1:1.15. The only two humeri of the Great Auk (*Pinguinus impennis*) in our collection from the kitchen middens of Funk Island differ in length with a ratio of 1:1.18. These two ratios are strikingly similar when one considers that only two specimens of each species are available for measurement. Since comparison is being made between a plaster cast on the one hand and a slightly water-worn original on the other, one should not ascribe too great importance to minute osteological differences. Therefore, until further material is available, a single species is considered adequate to include all the known specimens of *Mancalla*.

*Systematic position of Mancalla.*—What now of the systematic position of the genus *Mancalla*? Does the complete specimen throw new light upon its relationships? I must confess to a new and accentuated impression of specialization after study of the distal articulation in this latest material. Although we have a humerus that is fundamentally auk-like, the compression is extreme, the external and the internal tricipital groves are profound and are sharply defined by blade-like ridges, the articular condyles are reduced and they are brought together and shifted in position, so that they lie in a line that has rotated from the transverse direction seen in the majority of birds to one far nearer the sagittal plane of the bone, much as we see it in the penguins. The effect must certainly have been a marked reduction of freedom in the elbow joint. Pronation and supination must have practically disappeared, while flexion of the fore arm upon the upper arm could scarcely have been effected. There must have resulted a penguin-like swimming flipper rather than an organ of potential flight that could be folded away in typical bird fashion when its owner came to rest. The recession of the epicondylar prominence up the shaft suggests prolonged extension of the metacarpus, thus adding further to the impression of a flipper type of limb.

In my former paper on the species (1933) the following statement is made: "While it does not show genetic relation to the penguins, there are certain characters, presumably adaptive, that are strongly suggestive of that group, and which at the same time set it off from its nearest relatives, the Auks." Examination of this new material reveals such positive modification of the distal portion of the bone as to make it necessary to recognize the family Mancallidae if we are to harmonize the taxonomy of fossil birds with that of Recent ornithology.

*Relation to Pliolunda.*—A natural question to ask next would be "Is *Pliolunda diegense* a synonym of *Mancalla californiensis*?" This question was briefly discussed and was answered in the negative in the original description of *Pliolunda* (Miller, 1937). My conclusion was based upon the estimate by Lucas (1901) that *Mancalla* had a body size about equal to that of the Great Auk (*Pinguinus impennis*). On such a score, *Pliolunda* would be a far smaller bird than *Mancalla*.

With this new material at hand, I am inclined to feel that Lucas' estimate of body size was not well founded. The evidence supplied by the San Diego humerus points to *Mancalla* as a bird far more highly specialized toward the flightless habit than was *Pinguinus*. This would justify Lucas' contention that the bones of the pelvic limb would be strengthened in much the same proportion. Lucas may, however, have been under

the impression that the type specimen had lost more length by fracture than was really the case. The ratio of humerus length to femur length within a family group (see table 1) might be taken as a crude index of specialization toward a flightless habit. This ratio in *Lunda* is equal to 1.59:1, in *Pinguinus* it is 1.40:1. The San Diego humerus of *Mancalla* has a length of 65.2 mm. The type of *Pliolunda*, a complete femur, measures 55.7. Comparing these two figures gives a ratio of 1.20:1 which indicates a femur that is relatively larger than that of any other alcid examined. It would also completely refute my assumption of 1937 (p. 376) that the type specimen of *Pliolunda* was too small to be assigned to the species *Mancalla californiensis*.

Table 1

Ratios of Femur to Humerus in Alcids and Penguins

| | Humerus | Femur | Ratio |
|---|---|---|---|
| Uria aalge | 99.4 mm. | 50. mm. | 1.98 |
| Cerorhinca monocerata | 79.0 | 40.2 | 1.96 |
| Brachyramphus marmoratus | 48.4 | 25.0 | 1.93 |
| Ptychoramphus aleuticus | 46.6 | 28.5 | 1.63 |
| Lunda cirrhata | 79.0 | 49.4 | 1.59 |
| Pinguinus impennis | 106.8 | 76.2 | 1.40 |
| Mancalla californiensis | 65.2 | ..... | ..... |
| Pliolunda diegense | ..... | 54.2 | 1.20 |
| Pygosceles adele | 73.2 | 79.5 | 0.92 |

The San Diego beds have yielded thus far the fragments of six humeri of *Mancalla* but no associated femur. They have yielded also two complete femora of *Pliolunda* but with no humerus that is unquestionably associated. Both species show kinship to the family Alcidae but at least *Mancalla* is set off by a high degree of specialization. Such specialization may not necessarily have been reflected in the femur.

Pure coincidence may be a large factor in the picture and we must not allow it to overbalance the other values; still it must be conceded that *Pliolunda* might be a synonym of *Mancalla*. The following uncertainties, therefore, still confront us:

1. Are the San Diego humeri too small to be conspecific with the Los Angeles type of *Mancalla californiensis* Lucas? My own reaction is to include them within the range of species variability.

2. Should the femora designated as *Pliolunda diegense* Miller be considered as conspecific with the humeri identified as *Mancalla californiensis*? My own feeling is that there is much in favor of such a point of view but that the case is not proven and that the status should therefore best remain at present unchanged.

Table 2

Measurements of the Humerus of *Mancalla*, no. 2218 U. C. L. A.

| | |
|---|---|
| Extreme length between articular surfaces | 65.0 mm. |
| Greatest width of shaft | 9.8 |
| Thickness of shaft at thinnest point | 3.5 |

## SUMMARY AND CONCLUSIONS

1. A complete humerus of *Mancalla* from the San Diego Pliocene is figured and discussed; it is the first specimen to preserve the characters of the elbow joint. The specimen though small is considered to be conspecific with the type of the genus *M. californiensis*.

2. Characters of the elbow joint add greatly to the impression of extreme special-

ization toward a penguin type of flipper. The broader affinities lie with the Alcidae, but the extreme specialization warrants recognition of the family Mancallidae.

3. The possible synonymity of *Pliolunda* is discussed but is held to be inconclusive. The presence in the same exposure of a distal fragment of a humerus representing a true alcid strengthens this point of view.

4. Two new bird-bearing localities of Middle Pliocene age are here recorded.

5. Other vertebrate fossils retrieved from the same exposures include three proximal and two distal fragments of the humerus of *Mancalla*, a distal fragment of a humerus of a true alcid, a complete femur of *Pliolunda*, a number of undetermined bird fragments, a small rodent humerus, a splinter from an ungulate tooth, vertebrae of a whale, and teeth of sharks and rays.

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*University of California, Los Angeles, California, September 30, 1945.*

# THE STATUS OF THE WHOOPING CRANE ON THE ARANSAS REFUGE, TEXAS

By EARL CRAVEN

The protection of the Whooping Crane (*Grus americana*) was a primary consideration in the acquisition of the Aransas National Wildlife Refuge in 1937. Consisting of 47,261 acres situated on a peninsula between San Antonio and Aransas bays, in Aransas and Refugio counties, Texas, the refuge includes habitat that has been used consistently by these cranes for many years. The isolation and primitive nature of this area with its many bays and uneven coastline have undoubtedly provided major attractions for the birds. The shallow bays contain abundant marine foods and, inland, numerous brackish and fresh water ponds supplement the cranes' food supply with a variety of aquatic organisms.

Several members of the Fish and Wildlife Service have reported observations of the cranes on land now within the refuge. During the winter of 1935-36, G. B. Saunders observed 14 cranes in the course of a reconnaissance visit, and J. Clark Salyer II in a trip made in March, 1936, to the large peninsula jutting into Aransas Bay counted six birds. The Aransas Refuge was placed under administration in 1938 and J. O. Stevenson reported there as its first manager, remaining until he was succeeded by the writer on November 16, 1941. Mr. Stevenson followed the activities of the cranes closely and his records together with the author's data serve as a basis for this report.

In the first fall, that of 1938, migrants appeared on October 21 when two "Whoopers" were seen with a flock of 40 Sandhill Cranes (*Grus canadensis*). The largest number seen at one time that winter was 14, including two family groups. There was reason to believe that at times as many as 18 birds were using the refuge; four immatures were noted at widely separated localities. Portions of courtship flights and dances were noted on March 4, April 4 and April 8, 1939, and by the last of April, 1939, the various groups began merging on the flats about Mullet Bay. The last birds seen that season were two individuals on May 6.

First fall migrants of the following season were seen on October 21, 1939, and four days later two family groups with one young each were present in the northeastern part of the refuge. On November 14 the unusual observation of a pair of adults with two young birds was made. The largest number seen that season was 22 including six immature individuals present during early November. The last birds were seen on May 1, 1940. Reappearing in the fall, first migrants were seen on October 22. The second pair of cranes with two young to be recorded from the refuge was noted on November 2. Some increase was apparent this winter when 26 birds were present on December 17, 1940. The last birds to migrate in the spring of 1941 left about May 1, but one pair accompanied by a young bird spent the summer on the refuge area. Courtship displays were noted on May 16 and 23, but no evidence of nesting was obtained. The three birds used the refuge consistently, making only an occasional trip to nearby Ayres Island. Mr. Stevenson watched closely the young bird's plumage change from the cinnamon hue of the immature to the pure white of the adult bird. Assuming that it was hatched in June, 1940, it was approximately 14 months old in August, 1941, at which time the adult molt was completed. This appears to be the first summer record for the species in Texas.

In 1941, the first fall migrants arrived on October 21, deviating little from the schedule of the previous three autumns. Observations by the author indicate that the 1941-42 season was a low point in the history of the cranes since the establishment of the refuge, and only 15 birds were known to have wintered there. There were no verified reports of other wintering birds in the locality to account for the decrease. The year 1941 was lowest, too, in the numbers of young birds seen, as only two immatures were noted with the adults. The species was last seen in the following spring on May 5, 1942.

The cranes were first noted on the refuge in the fall of 1942 on November 4, although it is probable that they had arrived several days prior to that date. The December count of 19 birds was the largest recorded during the winter of 1942-1943, and the species maintained that number through the season. Apparently, the past nesting period had been more successful as four immatures were also present, two of which were in the same family group. The last observation in the spring of 1943 was that of a family seen preparing to migrate on March 23; this spring marked the earliest departure date yet recorded for the refuge.

Three cranes seen on October 29, 1943, constituted the first record for the season; this number increased to 19 in December and 21 were counted during a census in late winter. Five young of the year were also present at the latter time, all single young of different pairs. The majority of the birds left in early April, 1944, and the last observation was that of two seen on April 21. The first fall migrants of 1944 were three birds seen on October 20. By November 21 some 18 birds, including three immature individuals, were using the refuge. Their numbers fell off in December, and not more than ten remained for the balance of the wintering period. The others scattered up and down the coast and reports concerning them were received from localities both north and south of the refuge. The last observation for this past spring was of a family of three in May, 1945.

Pairs or families of Whooping Cranes appear to be far from gregarious with other members of their species; this has been noted especially when the birds feed along the shorelines and on the flats. Each family (two adults and one young) or pair seems to prefer a large block of territory for its exclusive use. However, no fighting between Whooping Cranes has been observed at the Aransas Refuge. Fights between this species and Sandhill Cranes have been noted on several occasions with two or three Whooping Cranes disputing the right of a large flock of two hundred or more Sandhill Cranes to the use of a feeding or watering area. In 1941, when there were only 15 wintering Whooping Cranes using the refuge, they were found spaced widely over the eleven square miles of coastal flats. Increasing to 19 birds in 1942, the birds still appeared to find sufficient room on these flats. In 1943 and 1944, however, some extension of range was noted and birds were found at distant points where they had not previously been observed. There may be some question as to the total number of birds that will concentrate on the refuge, and possibly the number will never exceed the 1939 or 1940 populations. Mr. Stevenson, in his article "Will Bugles Blow No More?" (Texas Fish and Game, October, 1943) mentions the reports of early settlers in this area to the effect that hundreds of "Whoopers" had congregated here.

In so far as it has been possible to determine, there have been no losses to the wintering birds on the refuge either from predation or other causes. In the early days of the war when airplane training flights were frequently made over the refuge, some concern was felt as to the effect on the cranes; happily, the birds soon became so accustomed to the planes that even when they passed overhead at low altitudes the birds continued to feed unperturbed.

The cranes made greater use of the brushlands of the refuge during the season of 1943-44 and on several occasions were seen moving into the brushline above the flats, even in some instances penetrating far into the interior of the refuge.

Refuge records indicate that a total of 26 young have been led to the Aransas Refuge by their parents in the six winters since the area was placed under administration. This is not an impressive figure, it is true, but it does indicate that young birds are being produced, and as long as the species continues to breed, there is hope for its survival. It is unfortunate that the protection afforded the "Whoopers" by the Aransas Refuge is so limited; the task of insuring the Whooping Crane's continued survival would be less complicated if it were not given to migrations that take it half way across the continent.

*United States Fish and Wildlife Service, Austwell, Texas, September 7, 1945.*

## FROM FIELD AND STUDY

**Lawrence Goldfinches Feed on Jumping Galls.**—In the week beginning August 7, 1944, some observations were made on a flock of Lawrence Goldfinches (*Spinus lawrencei*) which were feeding on seed fleas or jumping galls (*Neuroterus saltatorius*). Several valley oaks (*Quercus lobata*) in my yard, four miles north of Fresno, California, were heavily infested with this very small gall. The galls occur on the leaves, are spherical and are about one millimeter in diameter. The dry shell covering the gall is extremely thin. The jumping is caused by the rapid extension of the abdomen of the contained larva which strikes against the inner wall. The adult insect before emerging from the gall also causes it to bounce, in which case the motion is caused by the extension of the legs. When on the ground the active galls bounce in various directions, sometimes leaping as much as a centimeter in vertical distance.

There is a sound made by the gall which is readily heard, particularly when one stands under an infested tree. This seems to be caused by the larva undergoing the same motion which causes it to bounce on the ground.

The bouncing of the galls was first observed about August 1, and the goldfinches were also noticed at that time, but there was no particular association made between them. When a flock of about thirty birds continued to appear every day, the birds were observed more closely at short range with field glasses. At almost any time of day the goldfinches were present picking up the galls from the ground and gleaning them from the leaves in the trees. Most of the feeding was done on the ground but when the birds were disturbed, they would fly into the trees and pick the galls from the leaves. There was no way of determining whether the movement or the sound of the galls were in any way concerned with the feeding. Supposedly these two factors would be of little concern to a predominately seed-eating bird. Perhaps the galls were just juicy seeds to these birds.

Examination of the droppings of the birds disclosed only gall "hulls," suggesting that the diet, for the time being, was exclusively of these insects.

Goldfinches were present and actively feeding on the galls on August 26, the date of my last record.—A. E. CULBERTSON, *Fresno State College, Fresno, California, November 28, 1945.*

**The Composite Nature of the Name Cissilopha yucatanica (Dubois).**—The five specimens upon which Dubois based the name *Cyanocitta yucatanica* (Bull. Acad. Roy. Belgique, ser. 2, 40 (no. 12), December, 1875:797), were examined by me at the Musée Royal d'Histoire Naturelle in Brussels in July, 1939. These five cotypes (Dubois named no holotype) were found to represent two species and two named races of one of them. Three of these specimens, an adult, a pied immature, and a juvenile, were sent to the Museum by Ghiesbreght and belong to the species to which the name currently applies. The other two, both adults, were purchased from the dealer Parzudaki and are *Cissilopha sanblasiana*. Subspecific determination of the two *sanblasiana* was made on the basis of comparative measurements and colors as there were no other specimens available at the museum. None has the sex indicated.

All five of the birds are mounted on the conventional type of small bar perch and are in good condition. All are inscribed on the stands as "Type" and in the old register, written by Dubois himself, they are likewise so designated. They are numbered 5236 to 5240, inclusive, and are identifiable as follows:

5236, adult. On stand marked "Yucatan?", in register, "Mexique. Parzudaki"
[= *Cissilopha sanblasiana sanblasiana* (Lafresnaye). Wing, 139; tail, 153 mm.]
5237, adult. On stand marked "Yucatan", in register, "Yucatan. voy. Ghiesbreght"
[= *Cissilopha yucatanica yucatanica* (Dubois)]
5238, adult. On stand marked "Yucatan", in register, "Yucatan. Parzudaki"
[= *Cissilopha sanblasiana nelsoni* Bangs and Penard. Wing, 135; tail, 135 mm.]
5239, pied imm. On stand marked "Yucatan", in register, "Yucatan. Ghiesbreght"
[= *Cissilopha yucatanica yucatanica* (Dubois)]
5240, juvenile. On stand marked "Yucatan", in register, "Yucatan. Ghiesbreght"
[= *Cissilopha yucatanica yucatanica* (Dubois)]

Under the circumstances selective action is necessary, and I therefore designate number 5237 as the restricted type of Dubois' *Cyanocitta yucatanica*. This preserves the established name of the Yucatan Jay; otherwise some later investigator might justifiably, in case of loss or destruction of this individual, consider *yucatanica* to be a synonym of *sanblasiana*.

Measurements of the restricted type are: wing (chord), 137; tail (from insertion of central pair of rectrices), 161; exposed culmen (from edge of skin over ridge), 30.5; bill from anterior edge of

nostril, 21.5; depth of bill at nostril, 12.0; tarsus, 35.0; middle toe minus claw, 22.6; graduation of tail, 71 millimeters. The small size would strongly suggest that the bird is a female. Both of the young birds are a little larger and measure, respectively, 135, 154, 31.0, 22.2, 12.3, 41.5, 22.6, 52, and 141, 161, 31.3, 22.5, 13.5, 42.7, 23.2, 56 millimeters.

I have no first hand knowledge of *Cissilopha yucatanica rivularis* of Tabasco and Campeche recently proposed by Brodkorb (Auk, 57, 1940:547), but the measurements given by that author are far larger than those of the Dubois specimens and the race, if recognized, will retain Brodkorb's name. I mention the point since Ghiesbreght also collected extensively in Tabasco.—A. J. VAN ROSSEM, *Dickey Collections, University of California, Los Angeles, October 30, 1945.*

**Visitants to Humboldt Bay, California.**—The writer believes that the occurrence of the following birds is uncommon enough to warrant note. On November 6, 1945, while traveling around Humboldt Bay between Arcata and Eureka, California, a single American Avocet (*Recurvirostra americana*) was noted on the tidal flats. The bird was alone, and its light coloration made it stand out against the drab mud-flats.

On November 14, 1945, a Hermit Warbler (*Dendroica occidentalis*) was seen feeding in an alder swamp in company of a small group of Chestnut-backed Chickadees (*Parus rufescens*) and Ruby-crowned Kinglets (*Regulus calendula*). The writer is familiar with this warbler on its nesting grounds in the Trinity Mountains, but this is the first time that he has noted it in this vicinity. The late fall date is particularly noteworthy.—ROBERT R. TALMADGE, *Eureka, California, November 14, 1945.*

**Weights of Resident and Winter Visitant Song Sparrows in Central Ohio.**—In response to Wolfson's (Condor, 47, 1945:95-127) criticism of my failure (Trans. Linnaean Soc. N.Y., 4, 1937) to separate the weights of the resident and winter resident populations of *Melospiza melodia euphonia* in Columbus, Ohio, I have gone through my records and am able to present 174 weights of known resident males from October through March and 85 weights of birds I believed to be winter visitant males. Since these two classes do not differ in appearance nor in average wing measurements, behavior was the final criterion in judging status, and for this purpose the colored bands were indispensable for field identification. Residents proved themselves such by taking up territory in late January or in February. Birds with wing measurements of 65 mm. or over, trapped from November through February, that failed to take up territory were considered winter visitant males. Probably a few potential residents that failed to survive are included, as also possibly a few that settled far from Interpont, although my censuses extended one-half mile to the north and west and one and a half miles south of our house, the area to the east being closely built up and harboring few Song Sparrows. If only those "winter visitants" are considered that were known to have stayed until late February or March, 42 weights are available; the only difference in the averages, however, are 0.2-gram gains in December and January for these birds that were surely winter visitants. The earliest fall date for a known winter visitant was October 15, the latest spring dates March 27, 1931, March 8, 1932, March 27, 1933, April 1, 1934, March 11, 1936.

Weights in Grams of Male Song Sparrows on Interpont, 1931-36

| | Residents | | | Winter Visitants | | |
|---|---|---|---|---|---|---|
| Month | Number of weights | Extremes | Average | Number of weights | Extremes | Average |
| Oct. | 10 | 19.6-23.5 | 22.2 | 14 | 18.9-24.0 | 21.5 |
| Nov. | 12 | 20.0-22.9 | 21.4 | 15 | 20.0-24.3 | 22.0 |
| Dec. | 16 | 21.7-26.8 | 24.5 | 8 | 21.7-23.4 | 22.6 |
| Jan. | 24 | 22.7-30.0 | 25.2 | 7 | 21.2-27.6 | 23.7 |
| Feb. | 53 | 20.3-28.4 | 23.7 | 26 | 21.6-27.9 | 25.1 |
| Mar. | 59 | 20.1-27.9 | 23.1 | 14 | 20.3-25.7 | 23.8 |
| Apr. | | | | 1 | | 25.8 |
| Total | 174 | | | 85 | | |

The weights of the residents follow the expected course with its height in December and January and a falling off in February and March concomittant with territorial activity. The curve of the winter visitants lags behind, with a smaller rise in December and January (the data for these months are scanty), a peak in February, and a drop in March to the January level. The one April weight was of a bird whose three weights in February averaged 25.3 grams, and two weights in March, 24.9 grams; on April 1 I noted: "Very late to be here. Perhaps stays so very heavy, because fills up at the traps."

The only other known wintering birds on which I had a series of weights were four male Slate-colored Juncos (*Junco hyemalis*) and one immature male White-crowned Sparrow (*Zonotrichia leucophrys*). Six weights of the four juncos in November, 1931, averaged 19.5 grams; two weights of two of the birds in December averaged 20.2 grams; and seven weights of the four birds in March, 1932, averaged 21 grams. Three weights of the White-crown in January, 1936, averaged 35.4 grams, and two weights in February, 35.4 grams; on March 18 he weighed 32.3 grams and on April 21, 32.7.

Unfortunately I have few fall weights of known summer residents. A male, known by his singing to be a bird of the year in 1931, weighed 21 grams on October 1 of that year and was last seen on October 5; he returned between April 1 and 6, 1932, and weighed 24 grams on April 11; in 1933 he returned on March 13 and weighed 23.9 grams on April 12. Three females that returned to breed the following spring were weighed in the fall of 1931: one weighed 21.5 grams on September 10 and was not recaptured in 1932; the second weighed 23 grams while in molt on September 11, 21.4 grams on October 16, and 21.3 grams on her arrival on March 28, 1932; the third weighed 20 grams on September 12 and 20.1 grams on June 12, 1932, while feeding young. As to males that might have been summer residents or transients, 8 averaged 21.6 grams in September and 21 averaged 22.2 grams in October; these weights are about the same as those of the known resident males—9 averaged 22.4 grams in September, 10 averaged 22.2 grams in October. There appears to be no evidence in these birds of increased weight in connection with fall migration.

Wolfson in experiments in California found little gain in winter in resident birds, but marked gain in spring and fall just before migration in migratory birds. My experience in Ohio shows marked gain in winter in a resident population, and equal gain in February in a migratory population, but no evidence that weight increases up to migration. The two regions have very different winter climates.

Wolfson (p. 124) "cannot agree with the implications of the statement by Nice (1937) that a decided rise in temperature in late February will strongly stimulate some male Song Sparrows to migrate." Nevertheless, my table III and charts VI, VII and VIII clearly show a very close relationship between temperature and the migration of Song Sparrows in central Ohio. I did not consider temperature the only factor involved; I pointed out (p. 55) that: "High temperatures in December, January and early February have never brought a flight. Migration is dependent on both increasing daylight and rising temperature."—MARGARET M. NICE, *Chicago, Illinois, October 29, 1945.*

**Huge Migratory Flock of Purple Martins in Utah.**—About sundown, on August 11, 1945, when visiting the mouth of Provo River where it empties into Utah Lake, Utah County, Utah, an enormous flock of Purple Martins (*Progne subis*) was observed in feeding flight formation over the mouth of the river, the edge of the lake and the surrounding terrain. Birds were visible in every direction as far as the eye could distinguish them. No edge to the flock could be discerned.

Mosquitoes were common at this time and the individual birds were flying back and forth in every direction, wheeling and turning at random within the flock as would appear to be characteristic of birds chasing flying prey. This action continued without interruption from the time of first observation until nearly dusk, about one-half hour.

It was then noticed that instead of an approximately even distribution of birds in random flight, greater concentrations of birds appeared in some spots than at others. This did not appear to be due to chance because the aggregations tended to remain together more and more. Although it is true that some birds were continually leaving and others joining the concentrations, the groups tended to move with coordination of the members in great sweeps or curves.

Between dusk and dark, the northern edge of the flock came into view. Apparently the flock had been moving gradually to the south and west and by dark the last wheeling stragglers had passed by and were last seen to the southwest over the lake.

Attempts were made to estimate the numbers of birds observed, but the erratic movements in flight prevented any satisfactory computation. A final guess based upon mental impression of the enormous numbers of birds involved yielded a conservative figure of 25,000 individuals, but perhaps there were two or three times that number.

The Purple Martin is a sparse nester in the mountains of Utah. In all the years of the writers field experience he has never before encountered the bird in Utah, although it has been seen elsewhere. This recent experience, however, suggests that the species is a regular migrant through Utah.—ANGUS M. WOODBURY, *University of Utah, Salt Lake City, Utah, October 25, 1945.*

**Bulwer Petrel Breeding on Eastern Hawaiian Islands.**—The Bulwer Petrel (*Bulweria bulwerii*) is reported by Peters (Check-list of Birds of the World, 1, 1931:68) as "Breeding on islands off the coast of China; the Bonin Islands, Vulcan Islands, *the western Hawaiians* [italics mine] and Marquesas Islands in the Pacific Ocean; Madeira, the Salvages, Canary and Cape Verde Islands in the Atlantic." This petrel also breeds on the eastern Hawaiian Islands on small islets off the shores of

Oahu, as recorded by G. C. Munro and others in numerous articles in volumes 1, 2, and 4 of *The Elepaio*. It is now known to breed on Keaoi Islet off the central southeastern shore of Hawaii, where the writer on August 9, 1945, found two Bulwer Petrels in rock clefts and two white eggs. One of the eggs was outside the entrance to a cleft, while the other was within a cleft near an adult petrel. One of the petrels extracted from its burrow was an adult; the other was not seen and could not be reached, but it made sounds resembling short barks exactly in the manner as the one examined. Both eggs were addled and dried. On August 14 another adult was found, dead; it had been pinned down by a shifting

Fig. 4. Keaoi Islet, off the shore of Hawaii National Park, Hawaii.

rock but a few days before. No downy young were seen. On subsequent days several more visits were made to the islet and no more petrels were seen or heard, hence the colony may have been discovered just before the birds last to leave were ready to depart for the ocean at the end of breeding activities.

A search over the entire 2½-acre island revealed the presence of over 100 nests, then empty but recently occupied. If these were nests of departed Bulwer Petrels, the adult population would consist of more than 200 adults. No eggs or individuals of other species of petrels or shearwaters were seen.

The nests were located in chinks and clefts in the lava rock which comprised the island or in spaces under and between boulders. Nests were not on the surface, probably because there were no shrubs to afford protected sites. No burrows of any kind were dug in the small patches of shallow sand. Some of the nests were in narrow, almost closed-off chinks, while others were in open situations where wind and rain must have had free access. None was within reach of the spray drifting from normal-sized waves. They were most numerous in the cracks of a lava hummock at the central part of the islet which reached a height of 36 feet. No sticks, pebbles, or other movable materials were seen at the nests.

No rats or other mammals were present on the islet, although it was only 500 feet off the coast of the main island. This colony of birds has been undisturbed by man for many years.—Paul H. Baldwin, *United States National Park Service, Hawaii National Park, Hawaii, October 2, 1945.*

**Yellow-billed Magpies at Santa Barbara, California.**—This past summer Dr. Elmer R. Noble called my attention to the presence of two Yellow-billed Magpies (*Pica nuttallii*) around his home at 1250 Dover Lane in the Riviera section of Santa Barbara, California. This, according to Linsdale's "Natural History of Magpies" (Pacific Coast Avifauna No. 25), is the first record of them in Santa Barbara since 1887, although they have been reported by Bond at Goleta, six miles west of Santa Barbara, on July 3, 1941 (Condor, 43, 1941:247) and near Gaviota in the spring of 1935 and of 1937 (verbal).

The birds were first observed by Dr. Noble about July 1, 1945, and on almost every subsequent morning between 6:00 and 6:30 when they were seen and heard as they came to feed on food set out for the dog and cat and on bread crumbs scattered for birds. They stayed in the neighborhood most of the day and were often seen just before dusk. On the occasions I observed them they were seen in the top of a eucalyptus tree in a vacant lot adjoining his home and in the eucalyptus trees and coast live oaks on the steep chaparral-covered slope below his house and southeast of Jefferson School. From about August 13 to August 20, only one bird was seen and since the latter date none has been seen.—MARY M. ERICKSON, *Santa Barbara College, University of California, November 17, 1945.*

**Brewer Sparrow Banded at Hollywood, California.**—On September 28, 1945, I caught a Brewer Sparrow (*Spizella breweri*) in a water trap in my yard. The bird was first observed on September 26 but did not venture into the trap until the 28th, which was a very warm day. The bird was no longer seen after banding. Its under parts were unstreaked in contrast with the streaked breast of immature Chipping Sparrows (*Spizella passerina*) with which the Brewer Sparrow might be confused in the fall.

This seems to be the first observation of this species in Los Angeles County since a specimen was taken in the San Fernando Valley, Los Angeles County, by J. E. Law, on December 27, 1903 (Willett, Pac. Coast Avif. No. 7, 1912:80).—C. V. DUFF, *Hollywood, California, November 24, 1945.*

**A New Race of Aphelocoma unicolor from Southern Mexico.**—Recent study of a collection of 141 specimens of *Aphelocoma unicolor* from all parts of the range of that species has revealed the presence of an unrecognized race in Oaxaca. Although only three specimens are available to me from that state, the racial characters displayed by them are so distinct that continued nomenclatural association of the Oaxacan population with that of Vera Cruz, Puebla, and Mexico (Hellmayr, Cat. Birds Amer., part 7, 1934:58) would be erroneous. These populations are called *A. u. unicolor* by Hellmayr, but *unicolor* Du Bus has been found recently to apply to and antedate *coelestis* Ridgway of Chiapas and Guatemala; as a consequence, *unicolor* of Hellmayr has become *concolor* Cassin (van Rossem, Wilson Bull., 54, 1942:212; Brodkorb, Auk, 61, 1944:402).

In Oaxaca, *Aphelocoma unicolor* is known only from the central highlands surrounding Mount Zempoaltepec. *A. u. guerrerensis* occurs approximately 200 miles to the west, *A. u. unicolor* approximately 200 miles to the east on the other side of the Isthmus of Tehuantepec, and *A. u. concolor* (*sensu stricto*) approximately 100 miles to the northwest. Thus, the Oaxacan population lies geographically between *A. u. concolor* and *A. u. unicolor*. This point is of particular interest in the light of the characters distinguishing the Oaxacan race, which may be known as

**Aphelocoma unicolor oaxacae, new subspecies**

*Type.*—Adult female, no. 39121, collection of R. T. Moore, Pasadena, California; taken at Moctum, Oaxaca, Mexico, on October 18, 1941, by M. Toro Avilés.

*Racial characters.*—Similar to *A. u. guerrerensis*, but smaller; closest to that race in color, but slightly less purplish (between Cyanine Blue and Dusky Blue, tending toward Azurite Blue-Indulin Blue, of Ridgway, Color Standards and Color Nomenclature, 1912); compared with *A. u. concolor*, distinctly darker (more purplish) and with tail proportionally longer.

*Geographic distribution.*—Central highlands of Oaxaca, southern Mexico; known only from the three specimens for which locality data are given in table 1; reported by Du Bus (Esquisses Ornithologiques, livr. 4, 1848:pl. 17 and text) as *"Cyanocorax unicolor"* from Tepitongo and San Pedro, an unidentifiable locality, Oaxaca.

The possibility that an unrecognized race of *A. unicolor* occurs in Oaxaca first came to my notice

Table 1

Measurements of *Aphelcoma unicolor oaxacae*

| | Adult male (RTM-33382: Totontepec, April 7, 1942) | Adult female (type, RTM-39121: Moctum, October 18, 1941) | Juvenal male[2] (BS-144631: Mt. Zempoaltepec, July 31, 1894) |
|---|---|---|---|
| Wing | 156 mm. | 160 mm. | 150 mm. |
| Tail | 157 | 162 | 146 |
| Bill length | 20.2 | 18?[1] | — |
| Tarsus | 39.7 | 39.8 | 39.0 |
| Wing-tail ratio | 0.994:1 | 0.988:1 | 1.027:1 |

[1] Tip broken.
[2] In early stage of postjuvenal molt.

Table 2

Measurements of *Aphelocoma unicolor* in millimeters

| | | *A. u. guerrerensis* (Guerrero) | | | *A. u. concolor* (Vera Cruz) | | |
|---|---|---|---|---|---|---|---|
| | | Number of specimens | Range | Mean | Number of specimens | Range | Mean |
| Wing | ♂ adult | 16 | 163 -170 | 166.7 | 6 | 161 -167 | 163.5 |
| | ♂ 1st-year | 4 | 157 -161 | 159.5 | 3 | 153 -156 | 155.0 |
| | ♀ adult | 9 | 162 -168 | 164.8 | 1 | | 163 |
| Tail | ♂ adult | 16 | 164 -179 | 171.9 | 6 | 152 -163 | 158.2 |
| | ♂ 1st-year | 3 | 163 -170 | 166.6 | 3 | 143 -153 | 148.0 |
| | ♀ adult | 9 | 163 -175 | 168.4 | 1 | | 159 |
| Bill length | ♂ adult | 16 | 20.1- 23.4 | 22.09 | 6 | 18.1- 20.2 | 19.35 |
| | ♀ adult | 9 | 19.7- 22.3 | 21.39 | 1 | | 19.0 |
| Tarsus | ♂ adult | 16 | 39.3- 42.3 | 41.08 | 7 | 39.3- 41.8 | 40.31 |
| | ♂ 1st-year | 4 | 38.1- 42.0 | 40.73 | 3 | 40.1- 41.8 | 40.80 |
| | ♀ adult | 9 | 39.8- 41.5 | 40.72 | 1 | | 40.5 |
| Wing-tail ratio | ♂ adult | 16 | | 0.970:1 | 6 | | 1.034:1 |

when a single juvenal specimen (table 1) from that state was examined critically. Compared with one juvenal specimen of *concolor*, the body plumage of the Oaxacan bird is darker (between Fuscous and Fuscous-Black, not Chaetura Drab), the flight feathers are more purplish (Nigrosin Blue, not Indigo Blue), and the light areas of the bill are of a richer yellow (Honey Yellow, not Colonial Buff). Compared with juveniles of *guerrerensis*, that of *oaxacae* differs in color only in that the flight feathers are slightly less purplish (both, however, closest to Nigrosin Blue).

Subsequently, two adults from Oaxaca were borrowed from R. T. Moore, to whom I am indebted for the opportunity to study these specimens. These bear out all color differences evident in the single juvenal specimen. Both are darker than all available adults of *concolor* and are only slightly less purplish than *guerrerensis*. When an adequate series of *oaxacae* becomes available, it is probable that considerable overlap in color will be found between that race and *guerrerensis*, but in length of wing and tail, all three specimens of *oaxacae* fall below all specimens of a good sample of *guerrerensis* (table 2). (Wing and tail lengths do not differ between fully grown juvenal and first-year birds: see Pitelka, Condor, 46, 1945:234.) In length of wing, the three specimens of *oaxacae* are smaller than all available specimens of *concolor* of corresponding age and sex groups; but since only three specimens of the latter race are available, one can conclude only that the wing of *oaxacae* is not larger and may be smaller than that of *concolor*. The two races do not differ in tail length; as a result, the wing-tail ratio of *concolor* is greater than 1.00 in all available adult specimens, less than 1.00 in the two adults of *oaxacae*.

Thus, the characters of *oaxacae* appear to be a combination of the color and wing-tail ratio of *guerrerensis* with a small wing which is comparable in size or smaller than that of *concolor*. Consequently, the color contrast between *oaxacae* and the lighter, more bluish race *unicolor* of Chiapas is even more striking than that between the geographically more distantly separated races *concolor* and *unicolor*. The expression of color and size characters in *oaxacae* is distinct enough in only three specimens, especially when considered together with geographic relations, that I cannot regard them as intergrades or assign them to one of the presently recognized races pending the acquisition of more material.—FRANK A. PITELKA, *Museum of Vertebrate Zoology, Berkeley, California, November 1, 1945.*

**Golden Plover at Sea.**—On May 8, 1941, while crossing the North Pacific at about 155° 50′ W, a Golden Plover (*Pluvialis dominica*) was observed from the desk of the ship. It circled the vessel twice and continued northward. The following day, May 9, a bird of the same species came aboard the ship. It seemed very tired and was easily caught by one of the seamen. After a close examination and check for identification it was released, but it returned to the ship and was seen running about the deck an hour later. It eluded capture and remained on the deck until after sundown, going to rest on the canvas cover of the ship's boat. The following morning it was gone. Shortly after our arrival at Dutch Harbor, Unalaska, a Golden Plover was found dead on the beach.—ARTHUR L. BERRY, *Alhambra, California, June 11, 1945.*

# NOTES AND NEWS

Annual meetings of the Cooper Ornithological Club were discontinued during the war. It is planned to resume them with a meeting this spring at the University of California in Berkeley. Tentatively, May 17 to 19 are the dates set. Arrangements for out-of-town members will be announced later as problems of housing and transportation are clarified. It is urged that members begin now to prepare their contributions to the scientific program.—A.H.M.

On January 1, 1946, Margaret W. Wythe retired as Assistant Curator of Birds in the Museum of Vertebrate Zoology after 32 years of service with that institution. Her successor is Frank A. Pitelka.

At a meeting of the Board of Directors of the Cooper Ornithological Club in Los Angeles in October, 1945, Hildegarde Howard was elected a member of the Board to fill the vacancy caused by the death of George Willett. She also succeeds him as Secretary of the Board.

Just as this issue goes to press we learn of the death of two eminent naturalists, Allan Brooks and Thomas Barbour. Not long before, the Club lost another of its honorary members, Joseph Mailliard.

Since Grinnell's "Distributional Summation of the Ornithology of Lower California" was published in 1928 (Univ. Calif. Publ. Zool., 32:1-300), further field work and systematic studies have altered or in varying degree modified the then current treatments of the local species and races. At present A. J. van Rossem is engaged in preparing a revisionary distributional work on Baja California, which, barring unforeseen delay, should be completed in about a year. Although Baja California and adjoining islands will be the area of study in this report, the latter represents part of a prospective study of larger scope whose geographic limits are the Gulf drainage basin of the southwestern United States and northwestern Mexico. To this end, field work, in large part of preliminary or exploratory nature, has been conducted over the past several years in Baja California, Sonora, and southwestern Arizona. Work of a similar character, with emphasis on coastal and insular localities, is planned for 1946. No "priority" is claimed for any particular section of this area; on the contrary, Mr. van Rossem welcomes systematic or distributional studies which will lessen the amount of field work, which at best must be extensive.

In conjunction with Fisher and Baldwin's paper on problems facing conservationists on Midway Atoll and on southern Pacific islands in general (see page 3ff.), we quote from a short note in a recent issue of California Fish and Game (vol. 32, 1946:33): "On July 1, 1945, 60 10-week-old Mongolian pheasants were flown from the holding pens of the State Division of Fish and Game at Sacramento to Guam, in the Marianas Islands. This shipment was made at the request of Admiral Chester W. Nimitz, who was of the opinion that food, cover, and water conditions on Guam were ideal for pheasants. Other favorable factors were the absence of predators and the lack of other upland game birds to furnish competition." Additional details concerning the transfer are provided. It seems to us that the fact of this transfer as well as the questionable basis for it deserve general notice.

The Philippine Bureau of Science occupied the northwest corner of Taft Avenue and Calle Herran in Manila. It was an attractive group of modern buildings which housed the principal scientific collections in the Philippine Islands. The bird collection contained over 30,000 specimens including the types of forms described by McGregor and Manuel. Nothing now remains of all this except rubble and ashes. There is not a single ornithological specimen which can be salvaged. The metal trays which contained the study skins are twisted and blackened by fire. From the ashes of feathers and stuffing material I sifted wing and leg bones which were so friable that they crumbled at the slightest pressure. The heat which cremated the bird skins was so intense that light fixtures, specimen bottles, and photographic plates were melted into amorphous lumps of glass. The window frames are twisted and the roof has fallen in. Walls and cases are pocked and sieved with bullet holes. The library which was on the second floor of the main building was entirely destroyed.

However, during the Japanese occupation a collection of 500 skins representing 250 species of Philippine birds was "requested" as a gift to Premier Tojo. The skins selected were of common species and contained no types. The "request" was made by Dr. S. Hatai, the Japanese zoologist

in his capacity as scientific director in Manila. These 500 specimens represent the only remains of collections of the Bureau of Science. If they can be located, it seems proper that they form the nucleus of the ornithological collection when the Philippine Bureau of Science is rebuilt.

Dr. Canuto G. Manuel, ornithologist of the Philippine Bureau of Science, is alive and well at his home on Burgos Street in Pasay, a suburb of Manila. He may be addressed in care of the Department of Agriculture, Manila.

For more information concerning the fate of other collections and workers in the Philippines see Gressitt, Science, November 23, 1945, p. 537. —CHARLES G. SIBLEY.

I do not dare venture an estimate of how many years it was that we of the Southern Division relied on seeing Dr. Guy C. Rich walk into the regular monthly meeting and take a seat right up in front. With opaque eyeshield pulled down close, head up, and face to the front, he moved steadily forward till a changed pressure on his arm by his devoted and long-time friend, John Appleton, guided him to a seat where he could put his whole attention on the proceedings. The sight of that Damon and Pythias pair was always an inspiration to the rest of us—his junior fellows.

It was some decades ago that I first met Dr. Rich as a bird lover. His failing eyesight had demanded that he take off his professional training like a worn-out coat and hang it away in the closet. The meagre vision which remained to him at that time was supplemented by a long brass telescope such as many a retired sea captain of old New England kept in his hilltop "pilot house" to train upon his life-time loves, the sailing ships, that passed in and out through the harbor mouth. It certainly could reach out for the birds and bring those out-door friends into the restricted range of his crippled eyesight.

The "far-seeing glass" of his genial nature and ready friendliness served in like manner to bring close to Guy Rich the other lovers of his birds. A time finally came when the old brass telescope failed to do its work and had to be folded and laid aside, but the warm friendships, never.

There is no reckoning the number of younger naturalists that he inspired nor is there published a record of material assistance given to that young organization just floundering in its adolescence, the Cooper Club of a few years ago. His quick ear caught an item in the "minutes" that should be corrected before they were declared "adopted." His sane counsel helped the newly formed Board of Governors over many rough spots; while the hospitality of his home, presided over by the incomparable Mrs. Rich, ministered to our physical comfort at many Board of Governors' breakfasts.

Those of us who knew and admired Guy Rich through the years of his failing sight never heard a hint of complaint. He seemed always upheld by too brave a spirit for that. Certainly that serenity was an inspiration to us, his friends and fellows in ornithology.

I am glad that I knew Guy Rich. Now we must speak of him in the past tense but we can think and feel and appreciate in the ever present, with no constraining rule of the grammarian. Dr. Rich is to some of us still an active member of the Cooper Club.—LOYE MILLER.

## MINUTES OF COOPER CLUB MEETINGS

### SOUTHERN DIVISION

OCTOBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was called to order on October 30, 1945, at 8:00 p.m., by President Walter W. Bennett, in Room 145, Allan Hancock Foundation, University of Southern California, Los Angeles, with 60 members and guests present. The following names were proposed for membership: Adele Lewis Grant, 6019 Overhill Dr., Los Angeles 43, Calif., by Blanche Vignos; Gene Melvin Christman, 1017 No. Laurel Ave., Ontario, Calif., by Ralph H. Miller; Allen Joseph Duvall, Fish and Wildlife Service, Washington 25, D.C., by John W. Aldrich; and Mildred Farquharson, 2338 Marshall Ave., St. Paul 4, Minn., Esther L. O'Connor, 4344 Locust, Kansas City 4, Mo., and Mrs. Verna Mace Zander, Dept. of Physiology, Colorado State College, Ft. Collins, Colo., by John McB. Robertson.

The speaker of the evening, Dr. Loye H. Miller, told of the recent discovery of a new specimen of the extinct Lucas Auk.

Adjourned.—DOROTHY E. GRONER, *Secretary*.

NOVEMBER.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was called to order on November 27, 1945, at 8:00 p.m., by President Walter W. Bennett, at the Allan Hancock Foundation, University of Southern California, Los Angeles, with 40 members and guests present. The following names were proposed for membership: Mrs. Cressa C. Hancock, 1138 Norman Ave., Las Vegas, Nev., Carl Leavitt Hubbs, Scripps Institution of Oceanography, La Jolla, Calif., Walter A. Ross, 626 W. Caldwell St., Compton, Calif., and Emerson W. Stanley, P. O. Box 131, Garden Grove, Calif., all by John McB. Robertson; Lawrence T. Stevens, 918 E. Haley St., Santa Barbara, Calif., by Ed N. Harrison, and Oliver Nelson Wells, Edenbank Farms, Sardis, B.C., Canada, by W. Lee Chambers.

A committee consisting of W. Lee Chambers, J. R. Pemberton and Loye H. Miller, submitted the following resolution which was passed by the

Club as an expression of its feeling of loss in the death of George Willett:

WHEREAS, on August 2, 1945, the death of George Willett deprived the Cooper Ornithological Club of one of its most revered and distinguished members, who was Secretary of the Board of Directors, and had held nearly all offices in the Club during the many years of his unstinting service to the Club, and at the time of his death, had been elevated to Honorary Membership, and

WHEREAS, his friendship and enthusiasm were enjoyed and deeply appreciated by a remarkably large number of members who had benefited in the pursuit of their studies and avocations by his direct assistance, through his wise teachings, and by the example of his unfailing cheerfulness in helping to solve all problems,

BE IT THEREFORE RESOLVED, that the Cooper Ornithological Club express its profound regret in the untimely loss of this most valued member who in truth was a real anchor man who had served the Club with his utmost, and

BE IT FURTHER RESOLVED, that the resolutions be sent to the family with the expression of the deepest sympathy of the Club.

Dr. Miller moved, seconded by Mr. Davis, that due to pressure of the holidays, no meeting be held in December, that the President appoint a nominating committee and that the membership be notified by card. Motion carried.

Laurence Peyton announced that he had recently spent eight days in the San Pedro Mártir Mountains of Lower California where he learned that it had been two years since any condors have been seen in that area.

A. J. van Rossem spoke on the "Distribution of Southwestern Arizona Birds."

Adjourned.—DOROTHY E. GRONER, *Secretary*.

### NORTHERN DIVISION

SEPTEMBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on September 27, 1945, at 8:00 p.m., in Life Sciences Building, University of California, Berkeley, with President W. I. Follett in the chair and about 55 members and guests present. Proposals for membership were: Earl W. Craven, Aransas Refuge, Austwell, Texas, Even McMillan, Cholame, Calif., and Peter Norton, 115 Alpine Terrace, Oakland 11, Calif., proposed by Alden H. Miller; Miss Jessie Muir, 109 York St., Berkeley, Calif., proposed by Hilda W. Grinnell.

The following resolutions were read and unanimously adopted:

WHEREAS, in the death on August 2, 1945, of George Willett, who for forty years past has held the welfare of the Cooper Club in his thoughts and in his activities, we have lost an irreplaceable friend and member; and

WHEREAS, ornithology has lost an eminent scholar, one whose publications are indispensable in the study of western birds, and whose constant readiness to help others at all times has won the gratitude and admiration of all who knew him; therefore be it

RESOLVED, that we of the Northern Division of the Cooper Ornithological Club hereby express our deep sorrow at this loss which has come to the science of ornithology and to all persons who knew George Willett; and be it further

RESOLVED, that a copy of these resolutions, together with an expression of our profound sympathy, be sent from the Northern Division to Mrs. Willett; and that another copy be incorporated into the minutes of this meeting.

JOSEPH S. DIXON
HILDA W. GRINNELL
FRANK A. PITELKA.

The speaker, Jean T. Delacour, Consultant to the New York Zoological Society, discussed "Birds of the Philippines."

Adjourned.—ALICE S. MULFORD, *Recording Secretary*.

OCTOBER.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held at 8:00 p.m., Thursday, October 25, 1945, in Life Sciences Building, University of California, Berkeley, with about 53 members and guests present and President W. I. Follett in the chair. Frank R. Sedgley, M.D., of 1302 Harrison Ave., Redwood City, Calif., was proposed for membership by Susan E. Chattin, and Paul S. Baker, Pearsall Way, Bridgeport, Conn., was proposed by Hilda W. Grinnell.

Ruth Elwonger reported seeing two Black Rails and a White-tailed Kite in the marsh between Pt. Reyes Station and Inverness on September 30. Mrs. Curtis saw a Slate-colored Junco at Lake Merritt on October 12. Mr. Cain told of Yellow-headed Blackbirds seen in Yosemite last July.

Joseph S. Dixon spoke on "Trees, Birds, and Flowers of Crater Lake, Oregon."

Adjourned.—ALICE S. MULFORD, *Recording Secretary*.

NOVEMBER.—The regular meeting of the Northern Division of the Cooper Ornithological Club was held in Room 2503, Life Sciences Building, University of California, Berkeley, on November 29, 1945, with President W. I. Follett in the chair. The names of the following applicants for membership were read: Mrs. Marie Wells, 5708 Fresno Ave., Richmond, Calif., proposed by Susan E. Chattin; Norman Kester, Parkfield, Calif., and Carl F. Twisselman, McKittrick, Calif., proposed by Eben McMillan; Bobbie Keyes, 57 Selby Lane, Atherton, Calif., and Joao Moojen, Museum of Natural History, University of Kansas, Lawrence, Kansas, proposed by Jean M. Linsdale.

W. A. Hicks reported his observation of a Black Pigeon Hawk on the Klamath River, Siskiyou County, October 26. Mrs. G. Earle Kelly reported two juvenile Lesser Snow Geese at Lake Merritt on November 24. Charles G. Sibley observed a Snowy Egret at Berkeley Aquatic Park on November 6, 9, and 17, and found the Glaucous-winged Gull first occurring there on November 9, the Short-billed Gull on November 17, and the American Golden-eye on November 23.

The speaker of the evening, Mr. Ben Glading, Game Biologist of the State Division of Fish and Game, discussed "The Economic Aspects of Upland Game Management."

Adjourned.—RUTH ELWONGER, *Acting Secretary*.

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FOR SALE—Check-list of the Birds of Nebraska, by Hacker, Moser and Swenk. Reprinted from The Nebraska Bird Review, vol. 13, May, 1945. Forty pages, heavy paper cover. Fifty cents per copy. —DR. R. ALLYN MOSER, *R. F. D. No. 1, Omaha 4, Nebraska.*

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If you received an extra copy of the November-December issue of The Condor, will you please return it to W. Lee Chambers, Topanga, California.

Through some error in our mailing department duplicate copies were mailed of the last issue to an unknown number of members. It is very important that we keep our reserve stock up to average level, and we will certainly appreciate your cooperation in returning extra copies.

BUSINESS MANAGER'S OFFICE.

## PREPARATION OF MANUSCRIPTS FOR THE CONDOR

Articles published in the Condor normally are written by members of the Cooper Ornithological Club. Practically all the Club's money goes into the magazine; no editor and no business manager receive any pay other than the satisfaction of doing a service worthily. The preparation of good copy by the author will contribute greatly to accuracy of published output, dispatch in handling, and economy of production.

To be acceptable for inclusion in the Condor, articles must not duplicate in any substantial way material that is published elsewhere. Any type of subject bearing on birds may be considered; but the geographic areas of primary concern are western North America, Central America, and the Pacific Basin. Manuscripts may be submitted to any one of the editors (see inside front cover for address). Proofs with edited manuscripts will be sent to authors, at which time reprints may be ordered.

In the interests of accuracy and economy, observe the following: do not duplicate data in text, tables, or charts; check citations to original sources and verify text references; quoted statements must be exact replicas of the original; preferably use vernacular names applicable to the entire avian species (for a guide in this regard, see "The Distribution of the Birds of California," Pac. Coast Avif. No. 27, 1944:5-34); in general, avoid subspecific vernaculars; insert scientific names for species but not the subspecific name except in taxonomic papers or where the race concerned has been critically determined by the author or his collaborators; revise the manuscript repeatedly to remove superfluous words and phrases, immaterial detail, and repetitious statements.

Note Condor style and usage. "General Articles" and the "Field and Study" items are set up in different form. Provide a concise, meaningful title, and, where needed, subtitles within the text. Footnotes are not used. The address line may serve to indicate institutional connection, and to it should be added the date of transmittal of the manuscript. Terminal bibliographies are desirable where five or more titles are to be cited; otherwise, the references may be included in the text. For bibliographic style, note closely the practices employed in recent volumes of the magazine. A factual summary is recommended for longer papers.

Rules for copy.—(1) typewrite material, using one side of paper only; (2) double space *all* material and leave liberal margins; (3) use 8½ × 11 inch paper of standard weight (avoid onion skin); (4) carbon copies are not acceptable; (5) place tables on separate pages; (6) number pages in upper right hand corner.

Illustrations.—Photographs should be glossy prints of good contrast. Make line drawings with India ink; plan linework and lettering for at least ½ reduction; do not use typewritten labels on the face of the drawing. Provide typed legends on separate sheets.

Helpful references on writing: Manual of Style, University of Chicago Press, and Rules of the Editorial Committee, University of California Press. On scientific nomenclature: A.O.U. Check-list (with supplements 19 and 20) and Pacific Coast Avifauna No. 27; authors are not required to follow either of these works.

THE EDITORS OF THE CONDOR.

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